Fire Management Plan
Environmental Assessment October 16, 2000
Lake Roosevelt National Recreation Area

1.0 PURPOSE AND NEED FOR ACTION

Background

In 1946 the Secretary of the Interior, by his approval of an agreement between the Bureau of Reclamation, the Bureau of Indian Affairs, and the National Park Service (NPS), designated the NPS as the manager for the Coulee Dam National Recreation Area. The area included Franklin D. Roosevelt Lake, the Reservoir formed behind Grand Coulee Dam, and the "freeboard" lands that where purchased at and above 1310’ elevation. Through over 50 years of changes, including a name

change to Lake Roosevelt National Recreation Area (Lake Roosevelt National Recreation Area) in 1997, the NPS now manages approximately 47,438 acres of the 81,389 acres of total water surface, associated shoreline, and 12,936 acres of the 19,196 acres of total freeboard land. Also in 1990 two adjacent Indian Tribes where included in the Lake Roosevelt Cooperative Management Agreement with the other three agencies involved in the 1946 agreement. The Colville Confederated Tribe and the Spokane Tribe of Indians manage the remaining water surface and freeboard land.

The purpose and significance of Lake Roosevelt National Recreation Area, as articulated in the park's general management plan is as follows:

PURPOSE

- Provide opportunities for diverse, safe, quality, outdoor recreation experiences for the public.
- Preserve, conserve, and protect the integrity of natural, cultural, and scenic resources.
- Provide opportunities to enhance public appreciation and understanding about the area's significant resources.

SIGNIFICANCE

- It offers a wide variety of recreation opportunities in a diverse natural setting on a 154-mile-long lake bordered by 312 miles of publicly owned shoreline.
- It contains a large section of the upper Columbia River and a record of continuous human occupation dating back more than 9,000 years.
- It is contained within three distinct geologic provinces – the Okanogan Highlands, the Columbia Plateau, and the Kootenay Arc – all of which have been sculpted by Ice Age glaciation and catastrophic floods.

The Resource Management Plan (1997) acknowledges the need for suppression of all fires and for the development of a prescribed fire management plan. It states "… a full suppression policy is in effect… A prescribed fire program is being developed … for the fire-dependent (seral) ponderosa pine *(Pinus ponderosa)* forests in the park".

Purpose and Need

The NPS proposes approval of a Wildland Fire Management Plan for Lake Roosevelt National Recreation Area. Park implementation of the Federal Wildland and Prescribed Fire Management Policy Guidelines, with the associated changes of terminology and implementation procedures, makes it necessary that fire management plans reflect new direction. The preparation of a Wildland Fire Management Plan is required by the NPS Wildland Fire Management Guidelines (DO-18), which states: "All parks with vegetation that can sustain fire must have a fire management plan. The resource management objectives of the park may determine whether a prescribed fire component is needed". Vegetation at Lake Roosevelt National Recreation Area includes at least three fire prone ecosystems, these being steppe (semi-arid grassland), shrub/steppe, and ponderosa pine forests. Fire played a critical role in the health and maintenance of all three ecosystems.

Since the influx of Euro-Americans to the Lake Roosevelt National Recreation Area region in the 1820's varying levels of fire suppression occurred, beginning with the suppression of fires around building developments. Another form of unintended suppression increased as whites brought more livestock into the area. Livestock grazing would reduce the amount and continuity of the fine grassy fuels, essentially making areas less fire prone. This form of suppression was probably very localized on the overall landscape. Fire policies began to be formalized in the early 1900's as a reflection of catastrophic fires that resulted in part from an era of settler land clearing fires and poor logging practices. Once again fire suppression was an effort of local, rural citizenry. At the establishment of the recreation area, efforts were probably begun to actively suppress fires. This capability improved in the 1960's, when suppression became more effective, allowing fewer fires to grow beyond a matter of a few acres. Today Lake Roosevelt National Recreation Area fully suppresses all wildland fires on the recreation area. This is not expected to change with the approval of this plan although a prescribed fire element may be added to the management scheme.

The suppression of fire at Lake Roosevelt National Recreation Area has eliminated a high frequency low intensity fire cycle of 6 to 19 years typical of ponderosa pine forests. The benefits of these fires included reduction of duff material, recycling of nutrients, reduction of accumulating fuels, pruning of trees which reduced ladder fuels into the canopy, thinning of regenerating pines, sanitizing of trees with dwarf mistletoe, and the encroachment of young conifers into grasslands. These benefits have not been available with the

suppression of fires. Past wildland fire suppression actions have led to many forest stands that are overly dense causing a shortage of resources needed for vigorous growth. This limiting of resources affects not only the size and volume of the tree, but also reduces the tree's ability to fend off attacks by various endemic insect and diseases. In turn dying trees eventually lead to heavier fuel loads on the forest floor. The exclusion of fire in the steppe, shrub-steppe, and ponderosa pine ecosystems in the future will continue the stress on vegetation as systems become more and more out-of-sync from the norm. Stress in the vegetative community leads to more disease and insect mortality creating unnaturally heavy fuel concentrations.

The NPS at Lake Roosevelt National Recreation Area needs this plan to guide management decisions in response to wildland fire incidents occurring within Lake Roosevelt National Recreation Area and adjacent to the area's boundary. Presently and in the future all wildland fires will be suppressed. The size and configuration of LRNRA's land base eliminates the option of using wildland fire to obtain other resource objectives that may be possible in a park with a large aggregate acreage. In contrast the preferred alternative proposes to add a prescribed fire component that would enhance the NPS's ability to manage and improve the park's ecosystem components and processes while providing for firefighter and public safety.

Objectives in Taking Action

In accordance with NPS management policies, the wildland fire management program of a park, carefully guided by resource management objectives, should protect cultural resources and perpetuate the natural resources and their associated processes and systems. The preservation of natural and cultural resources within Lake Roosevelt National Recreation Area is the fundamental requirement for its continued use and enjoyment by park visitors as a unit of the National Park System.

General resource management goals are outlined in the Park's General Management Plan, and the Resources Management Plan. The General Management Plan states that a purpose of the Area is to "Preserve, conserve, and protect the integrity of natural, cultural, and scenic resources". The Resources Management Plan states: "In areas designated as natural or undeveloped zones, maintain or restore a semblance of indigenous flora and fauna and natural communities to achieve species diversity and community structure that approximates what would have been created by natural events and processes". As

mentioned above part of the "integrity of natural…resources" or "natural events and processes" includes a natural fire regime for the fire prone vegetation at Lake Roosevelt National Recreation Area. This plan also addresses resource management project statements LARO-I-800.000 *Continue Wildland Fire Management Program* and LARO-I-805.000 *Develop and Implement Prescribed Fire Program.*

- The proposed wildland fire management plan for Lake Roosevelt National Recreation Area includes the following objectives:
- Provide for firefighter and public safety. This is the first consideration and highest priority when implementing elements of the fire management plan.
- Develop a systematic approach to dealing with wildland fires as well as the planning and implementation of prescribed fire projects.
- Promote interagency planning where ever possible.
- Include rehabilitation techniques and standards that comply with resource management plan objectives and mitigate safety threats.
- Develop a wildland fire prevention plan appropriate for the park.
- Develop a fuels analysis plan.
- Develop a risk analysis for projected wildland fires in the park.
- Prevent, where possible, all wildfires from burning onto adjacent lands.
- Provide for the continuation of the natural role of fire in the ecosystem through the use of prescribed fires consistent with the protection of life, cultural/natural resources, including air quality, property, and adjacent land values.
- Mechanically treat fuels, including thinning of trees, in preparation for the use of management-ignited fires or treatment of areas where management ignited fires are not deemed appropriate.

11. Develop a prescribed fire-monitoring plan.

Issues Related to Fire Management

The above objectives will be accomplished in part to address issues and concerns brought up in the pre-scoping done for the Lake Roosevelt National Recreation Area Fire Management plan. These issues include:

- Hazardous fuel accumulations.
- Air quality concerns.

- Response of noxious weeds to prescribed burning.
- Prescribed fire effects on federal and state listed sensitive species.
- Escape of fires, especially prescribed fires, onto adjacent private land.

2.0 ALTERNATIVES

This section describes the alternatives considered, including the proposed action and a no action alternative. This section also summarizes the environmental consequences of the alternatives and defines the differences between the alternatives, especially in how their environmental consequences differ.

Elements Common to All Alternatives

1. Under all alternatives, full suppression actions will be taken on all human and natural caused wildfires. Full suppression actions would provide for public and firefighter safety, protect public and private resources, and utilize techniques that are least damaging to Lake Roosevelt National Recreation Area's natural and cultural resources.

2. Wildland fire use, the use of natural wildfires to benefit the resource, would not be allowed under any of the alternatives. "Human caused wildfires" does not include prescribed fire, UNLESS the prescribed fire goes beyond the management prescription and is declared a wildfire.

3. Mechanical treatment, including thinning of trees, may be used to reduce fuel loading.

Description of Alternatives:

Alternative A – (No Action) – Continue Full Suppression of ALL Wildland Fires, use of Mechanical Treatment and no use of Prescribed Fires.

This alternative would continue the current policy of aggressive full suppression of all wildland fire. Full suppression of fires would seek to limit fire spread as quickly as possible, while ensuring public and firefighter safety, protecting Lake Roosevelt National Recreation Area natural/cultural/historic resources, and minimizing costs. In most cases an appropriate management response would entail rapid

assignment of firefighters with hand tools and/or engines to contain and control the fire as quickly as possible.

This alternative would preclude the use of prescribed fire to benefit natural resources, this being the steppe, shrub-steppe and fire dependent ponderosa pine environments at Lake Roosevelt National Recreation Area. The continued absence of fire from the environment at Lake Roosevelt National Recreation Area will have many deleterious effects.

Mechanical fuel treatment and vegetative management projects may be used to accomplish a FEW of the objectives related to fire, such as hazard fuel reduction or ponderosa pine stand thinning. Mechanical hazard fuel reduction would be utilized around structures (including historic structures) to provide defensible space should a wildland fire occur. Debris associated with these projects would be lopped and scattered, chipped, piled and burned, or hauled off-site. This treatment may also be used around sensitive natural resources such as rare plant populations that are sensitive to fire or wildlife habitat, such as nest trees used by bald eagles (not during the nest season). As most of the developed areas have had some level of thinning, future treatment under this alternative may potentially lead to less mechanical treatment overall than is needed to implement a prescribed fire program.

Alternative B – (Preferred Alternative) – Suppression of all wildland fire, use of Mechanical Treatment and use of prescribed fire to achieve resource objectives.

Under this alternative full suppression actions would be taken on all human/natural-caused wildland fires; mechanical treatment of fuels would be performed; and prescribed fire would be initiated at Lake Roosevelt National Recreation Area. All wildland fires would be suppressed as quickly as possible, while ensuring public and firefighter safety, and protection of Lake Roosevelt National Recreation Area natural/cultural/historic resources, and developments.

Mechanical hazard fuel reduction would be utilized around structures (including historic structures) to provide defensible space increasing the potential for survival should a wildland fire occur. Debris associated with these projects would be lopped and scattered, piled and burned, or hauled off-site. This treatment may also be used around sensitive natural resources such as rare plant populations that

are sensitive to fire or wildlife habitat, such as nest trees used by bald eagles (not during the nest season).

This alternative would introduce prescribed fire to Lake Roosevelt. Prescribed fire would be used to: 1. Simulate the natural benefits (the historical range of variability) of fire on the ponderosa pine forests and grasslands; 2. Reduce hazardous fuel accumulations to protect the forest, natural/cultural/historic resources, public and private developments and property. Prescribed fire would be used to treat 100 acres over the next 5 years. It is possible that prescribed fire would not be utilized in some years due to staffing shortfalls or lack of favorable weather. Prescribed fire would be applied only when the prescription is met. A prescription includes measurable criteria that define conditions under which a prescribed fire may be ignited. Prescription criteria may include weather, specific control and holding forces, firing techniques, and timing.

NPS fire staff mapped out 32 fire units in 1995. Most of the units surround park developments and many border private developments. These units are small and were laid out based on natural and human-created fire breaks. One larger unit, Gifford to Cloverleaf (52 acres), is not considered a developed area. This site was included due to the extreme Western pine bark beetle activity that is killing large clumps of trees. This area is between two other units that have already been treated and borders private land. The area is a high priority for thinning due to the density and unhealthy nature of the stand. The forest health problems in this stand are the result of human intervention in preventing the once frequent fires that used to maintain a more open condition. The burn plan for Gifford to Cloverleaf would address different issues than the development areas. There would be less emphasis on maintaining shade, needing to deal with hazard trees, discriminating against structural defects and more emphasis on retaining wildlife snags, downed woody debris, openings for new pine regeneration, etc. A silvacultural prescription, prepared by the Colville Confederated Tribes Forestry Department, for the commercial size trees to be removed in the Cloverleaf to Gifford burn unit is in Appendix A. Some areas adjacent to private developments have been left out.

Much of LRNRA’s forests are anecdotally considered to be second growth stands that resulted from past forestry activities prior to the creation of the reservoir or during the clearing of the reservoir area. During the construction of the reservoir most of the work was done below the 1,290-foot elevation although a final reports states: "In the

upper reaches of the reservoir and in areas where there was danger of slides, clearing was carried to higher elevations". Many of the forest stands will require mechanical thinning to remove the small, suppressed trees that have grown up in these second growth forests in the absence of frequent fires. It is believed that trying to introduce prescribed fire into these stands would have potentially catastrophic results due to the density of trees. Generally the thinning treatment would "come from below" although occasionally a larger diseased or crowded tree would be removed. Typically only large trees that grew next to other large trees would be removed.

Mechanical treatment would be a pre-treatment designed to reduce fuel loading and ladder fuel continuity. Reducing ladder fuel continuity reduces the threat of stand replacing crown fires. Another mechanical treatment objective is to reduce the total fuel loading on a site through off site removal or through piling for later burning. Reducing the total fuel loading will reduce the effects of burning on the ground surface and subsurface soil layers. This treatment would be utilized at the landscape level to reduce crown fire potential. These treatments would consist of cutting (thinning) trees that have grown up into dense "dog-hair" thickets and other ladder fuels, such a shrubs that have grown in among the older trees increasing the potential for crown fire. Thinning has already occurred in some developed areas at Lake Roosevelt National Recreation Area. The objective of the thinning would be to remove smaller suppressed trees or those severely impaired by disease. Individual large snags will be retained where they don’t pose a significant safety hazard. This pre-treatment activity will only occur in the areas covered in this environmental assessment. Further work will be done by the NPS to assess the forest areas that are not in the developed zone. A forestry restoration plan will be completed to address these non-developed areas.

Alternatives considered but rejected.

Alternatives that have been rejected included an additional option of utilizing wildland fire use, along with suppression, mechanical treatment, and prescribed fire. Wildland fire use entails allowing natural caused fires, such as one started by lighting, to burn freely as long as it stays in the predetermined prescription levels. This is done in large pristine areas to allow the natural, often beneficial, role of fire to achieve resource benefits in fire dependent ecosystems. Due to the physical nature of Lake Roosevelt National Recreation Area this option could not be initiated without unacceptable risk to other landowners.

3.0 AFFECTED ENVIRONMENT

This section of the environmental assessment describes the existing environment potentially affected by the alternatives. An analysis of how the proposed action might effect these resources is found in the Environmental Consequences Section.

Background and Historic Role of Fire

The 12,936 acres of freeboard lands are the areas that will be impacted by the implementation of this plan. Freeboard lands are lands above the reservoir high water line purchased by the U.S. Government prior to the creation of the Reservoir. The geology of the area is typified by:

- The Okanogan Highlands, located north of the confluence of the Columbia and Spokane Rivers, are low rounded mountains considered to be a western extension of the Northern Rocky Mountains. This portion consists of the bottom flanks of the low rounded mountains. The tribes manage the northern shorelines along the Spokane and Columbia Rivers in this section.
- The Columbia Plateau, a large flood basalt plateau, South of the Spokane River and the Columbia (below the confluence of the Columbia and Spokane Rivers). This forms the Southern shoreline of Lake Roosevelt National Recreation Area and is the northern escarpment of the Columbia Plateau. . This portion consists of the steep North-facing basalt breaks along the Columbia River.
- Along the toe of the mountains and basalt escarpments, at the edge of reservoir, river valley terrace deposits consist of glacial moraines, outwash, lakebed sediments, and Missoula flood deposits that have been sculpted into terraces by alluvial processes. Most of these terraces are mantled with a layer of late Pleistocene and Holocene aeolian deposits. The geology and the physical orientation of the land have influenced the vegetation at Lake Roosevelt National Recreation Area.

Although the elevation range of Lake Roosevelt varies less than 1000 feet, and is semi-arid in climate, the plant communities change from near semi-desert conditions at Grand Coulee Dam to a mixed-conifer zone at the Northern Boundary near Onion Creek. Most of the plant communities at Lake Roosevelt National Recreation Area have the potential to sustain fire. One of the most prominent plant communities, ponderosa pine, is considered to be fire dependent.

The vegetation at Lake Roosevelt National Recreation Area fits primarily into three broad categories. These are steppe grasslands, shrub-steppe grasslands and transition forest (ponderosa pine). Other categories would include riparian/wetland, mixed-conifer, lithosol areas, rocky outcrops, and actively eroded slopes. The southern third of the lake is often moderate to steep slopes with a northerly aspect. The toe of these slopes have sedimentary terraces with fairly steep down slope sides. These areas are vegetated with bunch-grasses, forbs, and shrubs. The common shrubs are big sagebrush (*Artemisia tridentata spp*.), rabbitbrush (*Chrysothanmus spp*.), and antelope bitterbrush (*Purshia tridentata*). Some soil types support Douglas fir and ponderosa pine in shaded aspects and microsites). The common grasses throughout the whole area, particularly the dry sites include bluebunch wheatgrass (*Pseudorogenaria spicatum)*, Idaho fescue (*Festuca idahoensis)*, sand dropseed (*Sporobolus cryptandrus)* and needle and thread grass (*Stipa comata)*. The Northern two thirds is either mountain slopes or larger terraces. Both the mountain slopes and the large terraces have sedimentary terraces at their toe with fairly steep sides. The middle third is predominantly ponderosa pine forests with associated grasses, forbs and shrubs. Common shrubs include antelope bitterbrush, snowberry (*Symphoricarpos sp.),* serviceberry (*Amelanchier alnifolia)*, ocean spray (*Holodiscus discolor*), and wild rose (*Rosa sp.*). The upper third is similar to the middle section but has a little more moisture and in some places supports a mixed-conifer zone with Douglas fir and ponderosa pine. Other trees that occur include Western Larch (*Larix occidentalis)*, lodgepole pine *(Pinus contorta)*, Western paper birch (*Betula papyrifera)*, and grand fir (*Abies grandis)*. The shrub species are similar to the middle third with the addition of buffalo berry (*Shepherdia canadensis)*, and snowbrush ceanothus (*Ceanothus velutinus)*. Pinegrass (*Calamagrostis rubescens*) becomes more common in the northern third. The riparian zones, which are most well developed in the northern portion, are dominated by willows (*Salix sp.)*, alder(*Alnus sp.)*, black cottonwood *(Populus trichocarpa)*, water birch (*Betula occidentalis)*, and the occasional Western red cedar *(Thuja plicata)*.

Resources Affected

Air Resources

Ambient air pollutant concentrations for Lake Roosevelt National Recreation Area are within national and state air quality standards. This attainment status may be attributed to the relatively low population density near the National Recreation Area. Air-quality

related values, scenic vistas, and pollution sensitive resources have not been identified for the National Recreation Area. The predominant wind direction in this air-shed is from the south, southwest.

Although the air quality is generally very good in the national recreation area, it is affected by pollution emissions within and outside the area. Sulfur dioxide, nitrogen oxides and suspended particulate matter are the pollutants of concern from a smelter plant and a pulp and paper mill in the vicinity. The area experiences occasional episodes of high-suspended particulate matter from windblown dust from agricultural operations, unpaved roads, and exposed lakebeds during low-water periods. At times, air quality is also affected by smoke from wildland or prescribed fires that may occur within the national recreation area and surrounding area. According to the Washington State Department of Ecology the major air quality concerns in the Upper Columbia Valley Airshed include wood smoke, agri-burn smoke and fugitive dust.

Lake Roosevelt National Recreation Area is designated a Class II Airshed. This designation was established by Congress to facilitate the implementation of air quality provisions of the Clean Air Act. This designation allows a moderate increase in certain air pollutants. The Clean Air Act requires that the National Park Service comply with all federal, state, and local air pollution control laws (Section 118). The state agencies that manage air quality related concerns are the Washington Department of Natural Resources (DNR) and the Washington Department of Ecology. Ferry, Stevens and Lincoln Counties do not have county level ordinances regarding air pollution. They defer these concerns to the state DNR and Department of Ecology (DOE).

Adjacent to Lake Roosevelt National Recreation Area and part of Lake Roosevelt is the Spokane Indian Reservation, which is, designated a Class I Airshed. Class I designation mandates the most protective requirements for protection of air quality related values. The next area of concern is the Spokane Metropolitan Area that is between 25-85 air miles east, southeast. Spokane is a federally designated non-attainment area for carbon monoxide. A non-attainment area is defined in the Washington State Smoke Management Plan, as a clearly delineated geographic area that has been designated by the Environmental Protection Agency and promulgated as exceeding a national ambient air quality standard or standards for one or more of the criteria pollutants. The criteria pollutants include carbon monoxide, fine particulate matter (PM10), sulfur dioxide, ozone, and nitrogen

dioxide. Fortunately the prevailing winds would typically carry smoke to the north of this area. It is possible that a westerly airflow could carry smoke up the Spokane River Valley, which runs upstream to the city of Spokane. The next nearest Class I Airshed includes the Pasaytan Wilderness (Okanagon National Forest) 85 air miles west and the Cabinet Mountain Wilderness (Kootenai National Forest) 90 air miles east. As the predominant winds come from the SSW it is not expected that these areas will be impacted from an air quality standpoint.

Other areas of concern for air resources would include several towns and communities that are next to or near Lake Roosevelt National Recreation Area. These towns include Coulee Dam, Grand Coulee, Electric City directly adjacent to the western end of the park; Inchelium adjacent to the middle of the park; Kettle Falls and Colville which are adjacent on the north end, and Northport approximately 3 miles north. Other communities near Lake Roosevelt National Recreation Area that are not incorporated include Keller, 7-Bays, Hunters, Marcus, and Evans. There are also a few other small communities of a more informal nature that are next to Lake Roosevelt National Recreation Area that may also be impacted by any degradation of local air quality as will the rural population of the area.

Water resources

Water is the major resource that makes up Lake Roosevelt National Recreation Area. Lake Roosevelt is designated by the State of Washington as a class AA water body. This is the highest level in the state requiring the highest-level water quality standards. The water quality in Lake Roosevelt is somewhat impaired by both point and non-point pollutants. Studies have revealed that generally the water quality in solution is good but much of the sediment being carried in can tend to be toxic, containing heavy metals and organic pollutants.

The Columbia River above Lake Roosevelt has had close to 95 years of point pollution from a lead/zinc smelter (now the largest of its kind). Many tons of effluent and slag have flowed downstream into Lake Roosevelt. In the 1960's a pulp mill opened up upstream and began to discharge various congeners of dioxins and furans. This material has also appeared in the environment of Lake Roosevelt. Both industries have completed major upgrades to address these issues, and many improvements have been made. The Spokane River has been an area of concern as well. The largest population centers in eastern Washington and the Panhandle of Idaho are upstream of Lake

Roosevelt in the Spokane Watershed. Also upstream of these population centers is the Silver Valley Mining District that has operated for over 100 years.

The impacts of these sources of pollution are not as well defined. Current pollutants identified in the Spokane River portion of Lake Roosevelt have not been tied to any one known pollution source. Fortunately proposed fire management activities at Lake Roosevelt National Recreation Area should not add to or exacerbate these existing water quality issues as the impacts from burning would be related to nutrients and sedimentation.

Soils

Generally speaking the soils of Lake Roosevelt National Recreation Area are derived from the local parent material, which includes granite and basalt, covered by and mixed with imported material, which includes glacial, fluvial and wind deposited material. The topsoil layers are most often very thin and vulnerable.

In the Southern portion of Lake Roosevelt National Recreation Area the soil is formed from a mixture of colluvium derived from basalt, granite and loess; glacial and fluvial deposits; and overlying loess and/or volcanic ash. In the Northern portion of Lake Roosevelt National Recreation Area the soils are formed from primarily glacial and fluvial materials mixed with or covered by volcanic ash and/or loess layers. Major elements of these soils include glacial lakebed sediment, glacial outwash, glacial till, glacial flood, volcanic ash and loess deposits.

Plants

Located in a semi-arid transition zone, plant communities along the 150 mile-long reservoir gradually change from steppe and shrub steppe plant communities to transition ponderosa pine forest. As this is a transition zone between a grassland and a forest environment, large block definitions can be difficult due to affects of varying aspect and soil types. The three predominant plant communities include bunch-grass grasslands (steppe); shrub-steppe; and transition ponderosa pine forest. Other communities of note include wetland/riparian, lithosolic (rocky soil), rocky outcrops, and mixed-conifer forests.

Steppe/shrub steppe zone

The lower lake valley between Grand Coulee Dam and Keller Ferry is dominated by steppe (bunchgrass grassland)/shrub-steppe. Common species along this section include grasses such as bluebunch wheatgrass, needle-and-thread grass, and Idaho fescue; forbs such as arrowleaf balsamroot (*Balsamorhiza sagittata)*, northern buckwheat (*Eriogonum spp),* brittle prickly pear *(Opuntia spp)*, alumroot (*Heuchera spp)*, and lupine *(Lupinus spp)*, shrubs such as big sagebrush, rabbitbrush, and antelope bitterbrush.

Ponderosa pine zone

Between Keller Ferry and the upper end of the Spokane River Arm at Little Falls Dam is a transition from shrub-steppe to ponderosa pine forest (some second growth) common trees include ponderosa pine and Douglas fir. The grasses in the steppe/shrub steppe zone are also common in this zone. Forbes include arrowleaf balsamroot, northern buckwheat, and lupine; shrubs such as big sagebrush, rabbitbrush, and antelope bitterbrush. Red osier dogwood (*Cornus Stolonifera)*, willows (*Salix spp.)*, river birch (*Betula occidentalis*), and black cottonwood (*Populus trichocarpa*) are common in the riparian areas.

Areas along the middle and upper reservoir, between the Spokane River and Kettle Falls, are covered with a mix of dense ponderosa pine forests, and Douglas fir. The steppe environment within the boundary becomes less evident as in the previous sections. Grasses include those in the steppe/shrub steppe zone with the addition of pinegrass (*Calamagrostis rubescens*) in the ponderosa pine understory. Common forbs include hairy goldstar (*Crocidium multicaule*), phlox (*Phlox spp.)*, and nodding onion (*Allium cernuum*); shrubs include chokecherry (*Prunus virginiana*), serviceberry, wild rose, Douglas hawthorn, snowberry, and occasionally smooth sumac (*Rhus glabra*) and blue elderberry (*Sambucus cerulea*). Alder (*Alnus spp.*), willow, hazelnut (*Corylus cornuta*), and black cottonwood are common along the riparian areas. In the northern end rocky mountain juniper (Juniperus virginiana*)* may be found right next to the shoreline and on rocky river bars.

The upper valley, north of Kettle Falls to Onion Creek near the boundary, traverses a forest dominated by ponderosa pine, Douglas fir, and western larch. Some lodgepole pine, grand fir, rocky mountain maple (*Acer glabrum*), Western paper birch, and aspen can also be found. Among the pines and in dry, rocky areas, a variety of shrubs occur, including mallow ninebark (*Physocarpus malvaceus*), Creeping Oregongrape (*Berberis repens*), elderberry, chokecherry, snowberry

(*Symphoricarpos spp.*), deer brush (*Ceanothus sanguineus*), and red-stem ceanothus (*Ceanothus velutinus*). Dominant grassland species include bluebunch wheatgrass, Idaho fescue, and pinegrass. Small portions of this area could be considered part of the mixed-conifer zone that occurs farther north and higher in elevation.

The National Park Service manages plant species to control forest pests and diseases, eliminate exotic noxious plants, reduce hazard fuels, and maintain historic landscapes. NPS staff annually carry out measures to control forest pests, with assistance from the U.S. Forest Service. Forest insect and disease infestations are a continuing problem in the ponderosa pine forests. Many of these endemic pests have increased activities due to the poor forest health conditions. These poor conditions result in large part from suppression of the once common low intensity, high frequency fires. The most prolific forest pests in the area are the western pine beetle (*Dendroctonus brevicomis*) and Western dwarf mistletoe (*Arceuthobium campylopodum*), followed by mountain pine beetle (*Dendroctonus ponderosae*), red turpentine beetle (*D. valens*), pine engraver beetle (*Ips spp.*) and various root rots.

Noxious weeds

Another important plant component is exotic noxious plants. These plants are non-native, invasive, aggressive, and are defined in the Washington Administrative Code 16-1750. Some important "noxious weeds" include diffuse knapweed (*Centaurea maculosa*), spotted knapweed (*C. diffusa*), yellow star-thistle (*C. solstitialis*), leafy spurge (*Euphorbia esula*), Dalmatian toadflax (*Linaria dalmatica*), Canadian thistle (*Cersium arvense*), tumblemustard (*Sisymbrium altissimum*), and cheat grass (*Bromus tectorum*). These and other noxious weeds will be affected by fires and are an important consideration in dealing with the effects of fire. Lake Roosevelt National Recreation Area staff conducts noxious weed control activities in cooperation with county weed control programs, adjacent landowners, and other affected parties on Lake Roosevelt. However, the invasion of noxious vegetation continues to be a serious problem because control efforts have been limited by insufficient funding. In addition the narrow linear nature of Lake Roosevelt National Recreation Area and the numerous roads running the length of Lake Roosevelt National Recreation Area provides numerous corridors of dispersal into and out of the area.

Animals

Animals present at Lake Roosevelt National Recreation Area are typical for the semi-arid temperate conditions and the resulting vegetation. Some species, such as deer, can be considered to be quite abundant. Little information is available regarding rare species present at Lake Roosevelt National Recreation Area, as no systematic surveys have been conducted for any animal species except for fish and some aquatic invertebrates. Approximately 75 species of mammal, 200 species of bird, 15 species of reptile, 10 species of amphibians, may occur in Lake Roosevelt National Recreation Area. Little is known about terrestrial invertebrate species in Lake Roosevelt National Recreation Area. The observations of other federal, state, and tribal biologists contribute most information about the occurrence, abundance, and distribution of species at Lake Roosevelt National Recreation Area.

Given the linear nature of the national recreation area, terrestrial habitat for larger wildlife is somewhat limited. Although Lake Roosevelt National Recreation Area is too narrow to provide all aspects of a large mammal's range and habitat, it does provide important habitat to some charismatic species. The two major examples would be white-tailed (*Odocoileus hemionus*)/mule deer (*O. hemionus*) and bald eagles (*Haliaeetus leucocephalus*). The Washington Department of Fish and Wildlife's Priority Habitats and Species program has listed areas along the Columbia River in Lake Roosevelt National Recreation Area as important winter range for deer. For bald eagles, a threatened species, large ponderosa pine trees, and snags, provide critical nesting and roosting habitat.

Hunting is permitted within Lake Roosevelt National Recreation Area during established seasons. The Washington Department of Fish and Wildlife establishes the hunting seasons and related regulations. National Park Service and tribal rangers, state game agents, and county sheriffs enforce the hunting regulations.

Mammals

Common large mammal species using the area include whitetail and mule deer, coyote (*Canis latrans*), bobcat (*Lynx rufus*), badger (*Taxidea taxus*) and black bears (*Ursus americanus*). Less common large mammals present include elk (*Cervus elaphus*), moose (*Alces alces*), and mountain lions (*Felis concolor*). These larger species tend to move through the area in response to daily and seasonal migrations.

Small mammals found in the area include river otter (*Lutra canadensis*), *muskrat (Ondatra zibethicus*), mink (*Mustela vison*), raccoon (*Procyon lotor*), and striped skunk (*Mephitis mephitis*). In addition, bats, beaver (*Castor canadensis*), porcupine (*Erethizon dorsatum*), Nuttall's cottontail rabbit (*Sylvilagus nuttallii*), red squirrel (*Tamiasciurus hudsonicus),* Columbian ground squirrels (*Spermophilus columbianus*), chipmunks (*Tamias spp*.), yellowbellied marmot (*Marmota flaviventris*), shrew (*Sorex spp*.), voles, pocket gophers (*Thomomys spp*.), rats, and various species of mice are common.

Birds

The abundance of water and small adjacent areas of riparian and wetland habitats attract an abundance of avian species. Lake Roosevelt is within the Pacific Flyway and serves as a resting area during migration. Resident and migratory birds common to the area include large populations of waterfowl, shorebirds, gallinaceous birds, pigeons, woodpeckers, hummingbirds, raptors, and passerines.

Several species of raptors nest, roost or forage in the area. Among these are the osprey (Pandion haliaetus), golden eagle (Aquila chrysaetos), bald eagle (Haliaeetus leucocephalus), red-tailed hawk (Buteo jamaicensis), Northern harrier (Circus cyaneus), rough legged hawk (Buteo lagopus), American kestrel (Falco sparverius), prairie falcon (Falco mexicanus), and peregrine falcon (Falco peregrinus). Peregrine falcons have been reintroduced in Lake Roosevelt National Recreation Area in an effort to restore a breeding population to the area. At present, no aeries are known to have been established within the Recreation Area, but individuals have been spotted utilizing the Recreation Area. Owls include great-horned owl (Bubo virginianus), Northern saw-whet owl (Aegolius acadicus), Western screech owl (Otus kennicottii), short-eared owls (Asio flammeus), and barn owls (Tyto alba).

Dozens of species of passerines use the area for foraging and nesting. The most common of these include swallows, finches, jays, chickadees (*Parus spp*.), ravens (*Corvus corax*), American crow (*Corvus brachyrhynchos*), black-billed magpies (*Pica pica*), Western meadowlarks (*Sturnella neglecta*), American robins (*Turdus migratorius*), sparrows, blackbirds, mourning doves (*Zenaida macroura*), pigeon and juncos (*Junco hyemalis*).

Common waterbirds include surface feeding ducks (mallards, pintails, teal, and golden eyes), diving ducks (redheads, coots, and

buffleheads), western grebe, coot, lesser scaup, common merganser, common loon, and Canada geese. Wading and shorebirds in the area include sandpipers, northern killdeer, great blue heron, gulls, snipe, kingfisher, curlews, and yellowlegs.

Common gallinaceous birds include a combination of native and introduced species. Native species include ruffed grouse, sage grouse, and blue grouse. Introduced species include the ring-necked pheasant, chukar, Hungarian partridge, and California quail. A sensitive species in the region includes the Columbian sharp tailed grouse. This species is not known to occur in Lake Roosevelt National Recreation Area, but specific surveys have not been conducted. The elimination of natural sagebrush and bunchgrass communities on adjacent lands has severely reduced populations of shrub-steppe dependent species. Elimination of fencerows by agriculture has reduced habitat utilized by native and introduced species.

Reptiles and Amphibians

A systematic inventory of reptile and amphibian species has not been completed. Little is known about species occurrence, abundance, distribution, or critical habitat. Known reptiles and amphibians include the sagebrush lizard, short-horned lizard, western rattlesnake, gopher snake, western garter snake, western toad, great basin spade-foot toad, western tree frog, western painted turtle, and tiger salamanders.

Fisheries

Lake Roosevelt and its tributaries in the National Recreation Area support a varied fish community that today is considerably different from the native fish community of the early 1900's. The changes over time were caused by the introduction of nonnative species, habitat alterations such as water pollution, damming of rivers and reservoir drawdowns. Surveys in the 1990's have identified up to 30 species of fish in Lake Roosevelt National Recreation Area. Seven of these species were found in low numbers, with many represented by only one individual in one survey out of eight. Biologists believe that these individuals may occasionally wash down from reservoirs and lakes upstream or are introduced by unauthorized human introductions. Of the 30 species detected 10 are not native to the Columbia River. The most abundant species include large-scale sucker (*Catostomus macrocheilus*), smallmouth bass (*Micropterus dolomieui*), burbot (*Lota lota*), walleye (*Stizostedion vitreum*), kokanee salmon (*Oncorhynchus nerka*), and rainbow trout (*Salmo gairdneri*). One other important

species, because of its sensitive nature in the reservoir, is the white sturgeon (*Acipenser transmontanus*).

Sensitive plant species

Known sensitive species identified by the U.S. Fish and Wildlife Service or potentially present in Lake Roosevelt National Recreation Area includes one plant. The species of concern is the Ute ladies' tresses, *Spiranthes diluvialis*, listed as threatened by the state and under the Endangered Species Act. This species is not known to be located in Lake Roosevelt National Recreation Area but could potentially be present based on new discoveries in the Okanagon in similar habitat that may occur at Lake Roosevelt National Recreation Area. Thorough surveys by qualified individuals have not been completed to identify their presence or absence.

Sensitive animal species

Known sensitive species identified by the U.S. Fish and Wildlife Service or potentially present in Lake Roosevelt National Recreation Area include four animals. One is known to occur in Lake Roosevelt National Recreation Area, one species status is not known, and two are not known to occur in Lake Roosevelt National Recreation Area. The known species is the bald eagle, listed as threatened in Washington by the U.S. Fish and Wildlife Service. The bull trout (*Salvelinus confluentus)*, a threatened species, is not known to exist in the reservoir, according to Spokane Indian Tribal Fisheries Biologists. Dr. Al Sholtz, Eastern Washington University, with extensive fishery experience on Lake Roosevelt, believes that lake conditions, such as temperature, are not suitable for bull trout. The last two, grizzly *bear (Ursus arctos)* and gray wolf (*Canis lupus)*, have never been confirmed in Lake Roosevelt National Recreation Area. Their presence, although unlikely, would be transitory in nature due to human activity and disturbance along the Recreation Area.

Cultural Resources Lake Roosevelt Reservoir contains a rich assortment of both prehistoric and historic sites that contain evidence of the last 9000 years of human occupation in the Upper Columbia River Valley. Native American sites include housepit villages, seasonal camps, fishing locations, plant procurement, and burial sites. Most of the prehistoric sites in the reservoir have been subjected to some degree by erosion caused by the dam operations, but excavations in the 1970s and 1990s demonstrate that intact deposits still exist at many sites. Of the 191 sites recorded in the Recreation Area, 58 are

located above the reservoir high water line and subject to possible adverse effects from both fire and fire suppression activities. Another 10 sites located in the reservoir near the high water line could suffer disturbances from fire suppression activities if they occurred during a drawdown.

Historic sites in the Recreation Area document the successive developments of Euro-American settlement of the region from the early fur trade to the development of small towns servicing the developing mining, agricultural, and logging economies of the late 19th and early 20th century. The most important Early Fur Trade site in the Recreation Area is Fort Colville, located in the reservoir. Other important historic sites include the reconstructed St Paul's Mission at Kettle Falls and Fort Spokane located on a terrace above the confluence of the Spokane and Columbia Rivers. Later historic sites include homesteads, mining, orchard, and town sites. Most of the structures were removed from these sites when the reservoir was cleared prior to inundation, but surveys have documented abundant archaeological deposits associated with the sites.

Two historic districts have been nominated in the Recreation Area. The Kettle Falls Historic District encompasses the pre-reservoir Kettle Falls and includes 21 Native American sites, Fort Colville and the St. Paul's Mission located on the bluff overlooking the falls. The Fort Spokane Military Reserve Historic District encompasses 88 acres of the original 640 acres of the original reserve and includes the primary structural complex of the Fort.

The National Historic Preservation Act, as amended in 1992 (16 USC 470 et seq.); the National Environmental Policy Act; NPS Cultural Resource Management Guideline (1994), and Management Policies (1988) require the consideration of impacts on cultural resources listed on or eligible for listing on the National Register of Historic Places. Management actions described in this document are also subject to Section 106 of the National Historic Preservation Act

Visitor Use:

NPS mission, as described in the Organic Act of 1916, defines the purpose of all parks is to"…conserve the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same…". Scenic (visual) values, recreational activities, and general visitation within and around fire-treated areas may be temporarily impacted; thus visitor use will be considered an impact topic.

Safety: Public safety and safety of all personnel engaged in fire management projects is the primary concern of Lake Roosevelt National Recreation Area. Federal Wildland Fire Policy as expressed through NPS Fire Management Directive (D.O.-18) make safety the highest priority in determining fire management strategies.

4.0 ENVIRONMENTAL CONSEQUENCESThis section analyzes the environmental and sociological impacts of the two alternatives described in Section 2.0. This section will be organized by each affected resource, as presented in Section 3.0, *Affected Environment.* The impacts of Alternative A & B will be discussed for each resource. To get the overall impact of each alternative, read only the sections for a single alternative all the way through this portion of the document.

Alternative A & B Consequences by Affected Environment

Air Resources(Air) Alternative A – (No Action) – Continue Full Suppression of ALL Wildland Fires, use of Mechanical Treatment, and no use of Prescribed Fires.

Under this alternative air quality would be impacted by wildland fires burning within Lake Roosevelt National Recreation Area or by wildland fires burning adjacent to Lake Roosevelt National Recreation Area before they are suppressed. These are the conditions that Lake Roosevelt National Recreation Area currently experiences. The level of impact of this alternative on Air Quality would be dependent upon the incident rate, location, size, and time needed for suppression of any fires that would occur in a given fire season. As discussed earlier continued suppression at Lake Roosevelt National Recreation Area will lead to fewer, larger, more intense wildfires (and smoke amounts) during periods of varying smoke dispersal (sometimes poor) and during prime recreation periods (summer).

This alternative will continue to lead to environmental conditions that vary from the historical conditions of forest stands with fewer trees, larger diameter trees, and small accumulations of ground fuels and grass and shrub lands with less dead plant material and reduced encroachment by crowded stands of unhealthy trees. This continuing variance from historical conditions will create greater uncontrolled smoke production, from the burning of accumulation of fuels such as dense tree canopies, deadfall, ladder fuels, pine needle duff, and grass thatch that were historically removed by frequent wildland fire.

The affects of this alternative will lead to fewer occasions of fire overall, but the fires that do burn will be larger, more damaging, create significantly more smoke and may occur during times of poor smoke dispersal. The large amount of smoke produced and possibly the poor smoke dispersal during wildfires will lead to fewer but longer periods of unhealthy air quality and lower air quality compared to Alternative B.

Also if more fires occur during the prime summer burning period, because of fire suppression and the related impacts, more smoke will occur during the summer recreation period causing impacts to visitor enjoyment and to air related values (scenic vistas, etc.).

(Air) Alternative B – (Preferred Alternative) – Suppression of all wildland fire, use of Mechanical Treatment, and use of prescribed fire to achieve resource objectives.

In the short-term, smoke raising air quality concerns would increase in the area because you would have a similar amount of wildfires as in Alternative A and would also have the additional deterioration caused by prescribed fire. Eventually the overall amount of smoke that would raise air quality concerns would decrease for two reasons: 1. The more areas burned during good smoke dispersal periods would reduce the intensity of wildland fires that might occur in that area and will reduce overall particulates put into the air. This would in turn reduce the air quality impacts during poor smoke dispersal periods leading to a net gain in air quality. 2. Prescribed fires will only be conducted when optimal smoke dispersion periods are present leading to low air quality impacts in the immediate area. 3. Prescribed fires produce less smoke/emissions because they are carried out under less extreme conditions and burn less fuel than many wildfires.

The overall effect of this alternative to deterioration of air quality will not be known due to the unpredictable nature of wildland fire. A wet period of low wildfire activity may lead to lower fire/smoke impacts. A dry period may lead to more frequent, more intense fire/smoke activities that could increase the impact to air quality. Prescribed fire will reduce the impact overall by burning during times that the environment is able to absorb and disperse the smoke. This will reduce the impacts on the ground to humans, plants, animals, and resources.

Water resources(Water) Alternative A – Alternative A – (No Action) – Continue Full Suppression of ALL Wildland Fires, use of Mechanical Treatment, and no use of Prescribed Fires.

This alternative would impact water resources less frequently but more intensely and for a longer duration of time. The level of impact would be dependent upon the incident rate, location, size, and time needed for suppression of any fires that would occur in a given fire season. If fuel load situations and forest health are not improved by the reintroduction of prescribed fire then individual wildfires will become more severe leading to more severe impacts to the soil and vegetation. This will in turn increase the amount of potential erosion and influx of ash that impacts water quality. The effects may last longer depending on total acreage, severity of wildfire, and suppression impacts.

Soils that are severely burned, hydrophobic soils, will not allow water to infiltrate into the soil which in turn increases run-off creating erosion. It will also take longer for severely burned soil and vegetation to recover and subsequently reduce sediment run-off and sedimentation.

Another impact of this alternative will be the catastrophic removal of riparian vegetation in some places. This will remove a sediment buffer from the edge of the water increasing the chance for water quality degradation. Removal of vegetation near a stream will cause an increase in temperatures as the watercourse loses the shading protection of the plant canopy. The increase in temperature to a watercourse is a degradation in water quality and should be avoided.

(Water) Alternative B – Preferred Alternative) – Suppression of all wildland fire, use of Mechanical Treatment, and use of prescribed fire to achieve resource objectives.

This alternative will eventually lead to the reduction of impacts of fire on water. Frequent use of low intensity prescribed fire will reduce the impacts of fire on soil. Also the resultant reduction of fuels with the use of prescribed fire will lead to smaller and lower intensity wildfires in areas that have been treated by prescribed fire.

Since prescribed fire is usually conducted under conditions that will not lead to an intense catastrophic fire, soil and plants will be protected from severe erosion events after a fire. Areas that have been burned by prescribed fire will also have less intense wildland fires. This will reduce the chance of having a severe fire that will damage the soil and plants and lead to increased erosion, which in turn will lead to increased deterioration of water quality.

It is possible that with increased fire with the use of prescribed fire, impacts to water from soil erosion could increase to a small degree. This increase in the short-term would be mitigated by the fact that the managed use of fire will do less damage to soil and plants allowing quick recovery of the area and resultant reductions in water quality deterioration. If the landscape is not treated by prescribed fire, a slow increase in wildland fires will lead to increased water quality concerns due to the more severe affects of wildland fire on soil and plants, which leads to erosion into the water resource.

Use of prescribed fire will also allow for the protection of riparian and shoreline plants which act as sediment traps. This barrier will help to protect the water resources from deterioration from increased sediment run-off after a fire.

Soil(Soils) Alternative A – Alternative A – (No Action) – Continue Full Suppression of ALL Wildland Fires, use of Mechanical Treatment, and no use of Prescribed Fires.

Over all impacts of fire on the soil will be dependent on the frequency and severity of the wildfires that occur. If wildfires become more severe and more common during dry periods the No Action Alternative will lead to more severe impacts to soil on public and adjacent private land. During wetter periods this alternative may be less severe. As time passes the forests of Lake Roosevelt National Recreation Area will become denser, have greater fuel loads, greater duff thickness and fewer healthy trees. It is presumed that eventually, in the absence of fire, that the ponderosa pine forest will degrade to a state that will increase the frequency and severity of fires. These conditions will lead to more intense or severe fires. These intense fires will have greater acute and long-term impacts on the soils. McNabb, et al. states that "natural wildfires, particularly conflagrations that burn hundreds to thousands of acres, have a far greater potential to seriously affect soil fertility than current prescribed burns … because the weather is usually more severe and fuel moistures are normally lower (McNabb, 1990)."

These more severe fires that will occur in the future will have several impacts on the soils of Lake Roosevelt National Recreation Area. Fire can affect soil productivity by: reducing nutrients; killing soil micro-organisms that are critical to the soils fertility; altering soil structure, increasing impermeable soil layers; and removing the forest floor and vegetation leading to increased erosion (Walstad, 1990).

More frequent wildfire, a potential with this alternative, could lead to increased use of heavy equipment across the landscape. Use of caterpillars, tractors, wildland fire trucks, and hand line to suppress wildfires would lead to greater disruption of the soil.

Under this alternative the soils will also be impacted by use of heavy equipment to assist in mechanical fuel reduction. Soil compaction from use of heavy equipment, to remove portions of the trees, may lead to increased erosion of soils and reduced productivity and remove ground cover potentially impacting soils. To mitigate this damage the work will only be accomplished on frozen ground with a cover of snow. Work will need to stop should these criteria not continue to be met.

(Soils) Alternative B – Preferred Alternative) – Suppression of all wildland fire, use of Mechanical Treatment, and use of prescribed fire to achieve resource objectives.

Many of the negatives expressed in Alternative A will also be present in this alternative, although the effects will be lessened by introducing more frequent and less severe fires to the landscape. Under this alternative wildfire impacts will still occur. But eventually, as the use of prescribed fire is increased, wildfires will become less intense and or less severe. The reduction in severe fires will help protect soils from acute and long-term impacts that may occur in Alternative A.

All burning, whether wildfire or prescribed, disrupts the cycling of nutrients in forest ecosystems by changing the form, distribution, and amount of nutrients. But McNabbe, et. al. (1990) states "…sites with a history of frequent wildfires have already adapted to repeated cycles of nutrient losses and are less likely affected by prescribed burning". The cycle of prescribed burning at Lake Roosevelt National Recreation Area will attempt to simulate natural frequencies so as not to severely impact forest soils.

This alternative will reduce occasional impacts from wildland fire operations. As sites in Lake Roosevelt National Recreation Area are brought into a higher frequency and lower intensity fire regime, wildfires will become less frequent and/or less severe. This reduction will lead to a reduced need to use heavy equipment in an unplanned way on the landscape. Prescribed fires can be conducted in a way to avoid soil damage by any equipment use.

Under this alternative the soils will also be impacted by use of heavy equipment as in Alternative A to assist in mechanical fuel reduction.

Soil compaction from use of heavy equipment, to remove portions of trees may lead to increased erosion of soils, soil compaction and reduced productivity. Although under this alternative once the forest stands at Lake Roosevelt National Recreation Area have been brought under a prescribed burning program, less mechanical fuels treatments will be needed, reducing the use of heavy equipment on the landscape. To mitigate this damage the work will only be accomplished on frozen ground with a cover of snow. Work will need to stop should this criteria not be met.

Plants

(Plants) Alternative A – Alternative A – (No Action) – Continue Full Suppression of ALL Wildland Fires, use of Mechanical Treatment, and no use of Prescribed Fires.

The effects of this alternative on plants would continue as they have for the years that Euro-Americans have practiced various levels of fire suppression. The primary impact is the continued loss of frequent fires; one of the major natural disturbance forces on which health and diversity of LRNRA's plant communities depend. For example, in the ponderosa pine plant community, fire suppression causes ponderosa pine to decline as the more shade tolerant Douglas fir begins to expand into the understory. Eventually as the old ponderosa pines die the Douglas fir replaces the ponderosa pine (Arno, 1988). This can lead to an increase of various insect infestations and diseases, loss of forage for wildlife, and depletion of natural diversity and esthetic values (Arno, 1988:135). Periodic fires in ponderosa pine improves the forest condition by increasing herbaceous plant growth, allows for ponderosa regeneration, and stimulates most woody vegetation, which is valuable to wildlife. Another impact of fire suppression is the expansion of certain plant communities beyond their typical range. In the absence of frequent fire ponderosa can encroach on grassland communities, impacting these environments.

Native plant species adapted many different strategies to survive fire in this ecosystem. Some such as service berry or bluebunch wheatgrass resprout after a low severity fire while others such as antelope bitterbrush will likely need to reestablish by rodent cached seeds following a fire. Other species are adapted to take advantage of reduced post-fire competition. Seeds may be stored in the soil for long periods and only germinate following a fire or seeds, carried by wind to the burned area, find more favorable conditions for germination. Fire once played a critical role to the transition forests (ponderosa pine) of

Lake Roosevelt National Recreation Area, and also influenced the steppe and shrub steppes systems as well. Daubenmire states: "There is undoubtedly much truth to the common opinion that before the white man came, frequent fires caused by lighting or aborigines kept the pine stands in the grassy group open to the point of being savana-like". Much of Lake Roosevelt is contained within this "grassy" ponderosa pine habitat group. Investigations in ponderosa pine forests throughout the Western United states and Southern British Columbia have revealed that prior to 1900 most stands experienced surface fires at intervals ranging from 1 to 30 years .

Since fire usually sets back succession and creates openings, burned areas have a potential for noxious weed invasion if a seed source is available, particularly where soil surface is disturbed, such as suppression lines, camps or helispot construction.

Fire has long been an important influence shaping the plant communities of the Inland Northwest. The frequency with which a given area burned was dependent on the frequency of ignition, the plant community types, topography and regional climate. Fire as a physical process has several ecological functions:

- maintenance of plant vigor and productivity;
- reduction of woody fuel accumulations;
- maintenance or creation of early successional stages;
- and increase in plant community diversity;
- an increase in forage availability and nutritional quality.

Actual post-fire plant community succession is dependent upon four primary factors including:

- pre-fire plant community species composition;
- fire intensity and its effects on the existing plant community;
- post-fire environmental conditions including precipitation;
- the availability of seeds, rhizomes or other propagules to revegetate burned areas.

Response of major plant communities to fire

Most of the plant communities at Lake Roosevelt National Recreation Area have the potential to sustain fire. One of the most prominent plant communities, ponderosa pine, is considered to be fire dependent. The plant communities will be considered from the driest, steppe/shrub-steppe, to the wettest, the mixed-conifer zone.

Steppe/shrub-steppe zone

As with other vegetation communities at Lake Roosevelt National Recreation Area, fire exclusion has altered the natural succession and composition of grassland communities. Some grassland communities are being invaded by ponderosa pine that would have been eliminated as seedlings by frequent lightning or human (aboriginal) caused fires (Moir, 1966). As pine canopies close in over grassland areas the composition of the understory begins to change from bunchgrasses to more shade tolerant species such as snowberry or they are covered in thick mats of needles and dead branches. Some grassland habitats are rapidly changing from open areas with scattered pine, to thick stands of pine regeneration. Conversion of grasslands to forested stands of pine creates more dangerous fire suppression problems with grass fuels intermixed with dog hair thickets of pine.

In a similar way fire exclusion also favor increase in sagebrush in certain grassland communities.

Graminoid species:

Bluebunch wheatgrass; Idaho fescue; Needlegrasses

Steppe/shrub steppe plant associations at Lake Roosevelt National Recreation Area range from areas dominated by bunchgrasses such as bluebunch wheatgrass and Idaho fescue which occur in pure stands of grass, or intermingled with sage and other shrub species to transition zones where grasses are interspersed with mature ponderosa pine forests.

Most western grassland communities evolved in fire environments with frequent natural fire events ranging from every 3-5 years to longer intervals of up to 70 years (Weaver, 1951; Vogl 1965),. Short interval fire frequencies, 5-20 years, are most often reported for grassland habitats. Most gramanoid species are well adapted to fire either through structural, physiological or reproductive strategies.

The perennial grasses native to Lake Roosevelt National Recreation Area grow from central root mounds called tufts, or tussocks. These bunchgrasses are capable of vegetative reproduction from these tufts and will present new flower/seed stalks each spring. At the time of the year that natural fire occurred, summer, growth, flowering and seeding of the grass is complete and the plant is in a physiological state of dormancy. As fire passes through a stand of bunchgrass, the

dead upper portions of the plant are burned off leaving the tuft intact to produce new growth the following year. Early season burning can create high mortality rates among vegetation as the high moisture content of the plant causes high heat transfer to internal tissue. Fire can also create seedbeds for regeneration of new grass plants.

Bluebunch wheatgrass regenerates vegetatively and by seed following fire. Because of its relatively few, coarse leaves and large stems, little material accumulates at the base of the plant to serve as fuel. Prolonged high temperatures normally do not occur at the root crown, and most basal buds will survive (Antos, et al., 1983). Severe fires caused by increased accumulations of fuel or presence of a dense shrub component will kill bluebunch wheatgrass (Fire Effects Information System or FEIS, *Pseudoroegneria spicata*, Fire case studies). Idaho fescue is more sensitive to fire than bluebunch wheatgrass. Studies have indicated high mortality levels to Idaho fescue from summer burns with virtually no mortality in the fall when the plants were dormant, although fire reduced the basal area of the tufts. Idaho fescue can survive low to moderately severe fires (Eugene, et al., 1966). Idaho fescue has a finer, more dense culm which can lead to smoldering that can in turn damage or kill the plant. Wright and Klemmendson 1965, found that season of burn, not burning intensity, was the critical factor in mortality of needle-and-thread (*Stipa comata)*. Similar results were reported by the same researchers for Sandberg bluegrass (*Pos sandbergii*).

Shrub species:

Artemisia tridentata ssp. tridentata big sagebrush, Artemisia tripartita ssp. tripartita *Threetip sagebrush, Chrysothamnus nauseosus* Common rabbitbrush, *Purshia tridentata* antelope bitterbrush.

Shrubs make up a critical portion of the shrub steppe plant communities. Big sagebrush along with antelope bitterbrush makes up important habitat for many wildlife species. These shrubs are most often killed by fire, and must regenerate from seeds that are produced from plants that survived within or along the fire perimeter. Three-tipped sage and rabbitbrush can resprout from rootstock that survives low to moderate severity fires.

Big sagebrush (BS) in combination with several species of grasses, which compose the understory, is the dominant shrub in LRNRA's shrub-steppe zone. This plant community makes up part of the

Southern third of Lake Roosevelt National Recreation Area. Rabbitbrush is also a common associate with BS.

BS is easily killed by fire but prolific seed production from nearby unburned plants (if available) and from soil cached seed, coupled with high germination rates enable seedlings to establish rapidly following fire. Wind-, water-, and animal- carried seed contribute to regeneration on a site (Johnson, et. al. 1968). Seedling establishment may begin immediately following a disturbance, but it usually takes a decade or more before BS dominates the site (assuming there is a suitable

seed source nearby). Transplanted BS is noted to begin reproduction in 3 to 7 years. In areas where grazing has occurred historically at Lake Roosevelt National Recreation Area, a large component of cheat grass (*Bromus tectorum*) may be present with BS. Should a severe fire occur, cheat grass along with rabbit brush, could end up dominating the site for several years.

Artemisia tripartita ssp. tripartita Threetip sagebrush(TS) is listed by Daubenmire as being the most common sagebrush plant in the region that encompasses the southern third of Lake Roosevelt National Recreation Area. Fire will kill TS but this plant can sprout weakly after a fire (Volland, et al., 1981). It is also a vigorous seeder if enough plants are left after a fire.

Chrysothamnus nauseosus Common rabbitbrush (CR) is an important seral shrub associated with LRNRA's shrub-steppe communities. Low to moderate severity fires allow for CR toresprout readily from buds on or near the stem base. At higher fire intensities these buds may be killed (Wright, et al., 1979. FEIS, *Chrysothamnus n.* Fire effects). Surviving plants and those near the burn margin can quickly recolonize the site by production of wind borne seed. Biomass production remains low for one to three years and then increases rapidly. Burning temporarily eliminates sagebrush and other plants that compete for resources such as water or space. Release from competition stimulates rubber rabbitbrush to produce large numbers of viable achenes. Seedlings that emerge from these achenes are able to establish successfully because of their rapid root elongation (Mckell, 1956. FEIS*, Chrysothamnus n*. Fire effects)

CR is sensitive to competition, and the presence of other perennial plants will moderate its reproductive output. Sites with a good understory of perennial grasses and forbs are less likely to be

dominated by rabbitbrush after burning than those where the understory has been depleted. CR can dominate stands for a decade or more, but it is generally superceded by sagebrush (FEIS, *Chrysothamnus n*. Botanical and ecological characteristics). Low disturbance following fire can decrease spread of rabbitbrush as well (like resting an area from grazing for a minimum of two growing seasons).

Antelope bitterbrush (AB) is one of the more important shrub species in the shrub steppe plant communities of Lake Roosevelt National Recreation Area. AB is also an important component of ponderosa pine- AB communities, to be discussed below. AB is a very important browse species. It is utilized by a variety of wildlife for cover, browse, and seeds (FEIS, 2000, Purshia tridentata, Value and use). AB is one of the major winter browse species in the southern half of Lake Roosevelt National Recreation Area. Wildfire and severe prescribed fire may eliminate this species in some areas.

AB regenerates after fire either by sprouting or from off-site seed cached by rodents (Nord 1965). The type of AB that survives fire is a low decumbent form that is not dominant at Lake Roosevelt National Recreation Area. Lake Roosevelt National Recreation Area typically has the upright form that usually dies from fire (Bunting, et.al. 1985). Both occur in the area. Summer fires, which would typically be wildfires at Lake Roosevelt National Recreation Area, could be very damaging to AB.

AB age also determines ability to resprout. It is reported that AB less than 5 or greater than 60 years old do not sprout well (FEIS 2000, *Purshia tridentata,* Fire effects). Lake Roosevelt National Recreation Area has a large amount of AB that is probably older than 60 due to the 100 plus years of fire suppression activities. As wildfires occur at Lake Roosevelt National Recreation Area, areas with AB will be expected to loose a large component of this important shrub. Prescribed fires can be timed to minimize the effects of fire on AB. Even though AB is sensitive to fire effects, its present in plant communities with a high fire frequency attests to its adaptability to survive in these environments.

In the steppe/shrub steppe plant communities it can be seen that fire is a frequent disturbance agent with varying effects depending on the condition of the current plant community. Absence of fire generally has a detrimental effect on these plant communities. Without fire bunch grasses such as bluebunch wheatgrass, and Idaho fescue can build up

fuel that can damage or destroy the grass tuft that is required for these grasses to resprout; or shrubs such as bitterbrush can become to decadent to be able to sprout after fire. In grass communities near ponderosa pine communities, grasslands can be reduced by invasion of pine forests in the absence of fire. Eventually some of these communities can recover if they were not previously altered by disturbances such as grazing, and/or exotic weed invasion.

Transition Forest Zone

Ponderosa pine. As noted above antelope bitterbrush is an important shrub understory species in ponderosa pine plant communities at Lake Roosevelt National Recreation Area.

The primary tree species at Lake Roosevelt National Recreation Area is ponderosa pine. In Lake Roosevelt National Recreation Area this species occurs at the transition from steppe/shrub steppe plant communities to continuous forest cover in the mixed-conifer zone. Greater than half of Lake Roosevelt National Recreation Area is typified by ponderosa pine. This zone plays a critical role in wildlife habitat, species diversity, and aesthetics at Lake Roosevelt National Recreation Area.

Ponderosa pine is considered a fire dependent species, typified by frequent fires of low intensity. Investigations of ponderosa pine forest throughout the western United States and southern British Columbia, Canada, have revealed that prior to 1900 most stands experienced surface fires at intervals ranging from 1 to 30 years (Arno, 1988:133).

The impacts of fire on ponderosa pine, both prescribed and wildfire, have immediate effects in terms of injury and mortality, as well as indirect effects in altering the environmental conditions within the stand. Direct effects can be observed in terms of scorching and charring of the tree bole, limbs and needles. Fire often cause "cat facing" or depressions at the base of the tree where fire has burned into the interior tissue of the tree. These depressions can often claim more than 60 percent of the base of the tree and the tree will survive. Charring of external bark on ponderosa pine, while not aesthetically pleasing, is often of no consequence in the long term health of the tree. Ponderosa pine has thick external bark layers up to 1.5 inches thick which protects the internal cambium from injury. In areas where natural fires occur, the canopy of the ponderosa pine starts 50-70 feet up the tree bole. This is caused by previous fires which "prune" off the lower branches. The tree becomes more efficient from a

photosynthetic standpoint, since most of the tree canopy is high above the forest collecting sunlight, with most of the older, lower branches being removed. The tree is also more resistant to canopy scorch injury with the branches being higher on the tree bole. Research has demonstrated that ponderosa pine can sustain up to 90 percent crown scorch and survive (Harrington, 1981). Experience at nearby Turnbull Wildlife Refuge shows this level of crown scorch is survivable, but the tree often dies in following years due to pine bark beetle attack (Dendroctonus ponderosae), injury to surface root systems, or some combination of factors (Plantrich, 2000). Fire mortality can result in creation of important snags for wildlife use, such as the bald eagle. Old snags can be partially consumed by fire and fall, creating log habitat on the forest floor.

The following conditions described for Turnbull Wildlife Refuge, Washington are likely to occur at Lake Roosevelt National Recreation Area. Experience from prescribed fire at the refuge has demonstrated that groups of trees of the same age class, height and diameter, growing in the same immediate area (within feet of each other), being subjected to the same level of fire intensity, exhibit differential resistance to mortality or subsequent secondary effects. This may suggest some level of genetic variation in terms of adaptability to fire, insects and disease or differing levels of duff consumption. Post-settlement second growth ponderosa pine forests of the interior west have grown to maturity without the influence of frequent natural fires or insect attacks as genetic selection factors. All of the trees that regenerated following the removal of the old growth were able to survive due to fire suppression activities. In the past, the frequent natural fires would allow only the most fire adapted trees to reach maturity, and being fire adapted would make them resistant to the injuries that predisposed trees to insect attack. Without the influence of fire in thinning stands of ponderosa pine and selecting the most fire adapted trees, present conditions of overstocked stands have been attained throughout the range of the species. Many of these trees are in poor condition resulting from competition for light, moisture and soil nutrients. Herbaceous growth is very low within the stands due to the lack of light penetrating to the forest floor and with habitat conditions that are of limited value to wildlife. Fuel loading is extreme in many cases and ladder fuels within these stands create conditions for crown fires. These types of stands have been described by researchers as being predisposed to major insect infestations (Pantrich 2000).

Other impacts of continued fire suppression include buildup of fuels in ponderosa pine forests. This includes increased loading of litter and

duff around the base of mature trees, which decreases their survival in a fire. There is a buildup of dead woody material including dwarf mistletoe brooms. These forests also have an increase in ladder fuels such as shrubs and understory conifers, which allows development of severe crown fires.

Many pre-1900 forests were dominated by ponderosa pine as a major seral species in mixed-conifer forests of Douglas fir and grand fir forests. In the absence of fire these areas have moved toward their successional climax. With the cessation of frequent fires, the trend toward dense stocking and domination by shade-tolerant species favors other mortality agents such as mountain pine beetle (*Dendroctonus ponderosae*), dwarf mistletoe (*Arceuthobium campylopodum*), and comandra blister rust (*Cronartium comandrae*) in dense ponderosa pine forests; western spruce budworm (*Choristoneura occidentalis*), tussock moth (*Orgyia pseudotsugata*), and root diseases in "firs"; Indian paint fungus (*Echinodontium tinctorium*) in grand fir; and dwarf mistletoe (*Arceuthobium douglassii*) in Douglas fir (Arno 1988: 135).

This alternative will lead to a continued decline of climax and seral ponderosa pine forests at Lake Roosevelt National Recreation Area. In some areas severe wildfires will occur that will destroy many of the forest values at Lake Roosevelt National Recreation Area and threaten other resources and structures within the area and on adjacent private and public lands. Other areas will move to climax conditions which will, especially in dry periods, lead to increases in insect and disease conditions, and severe intensity fires.

Mixed-conifer zone: Douglas fir, Western Larch, common snowberry (*Sympocarpus albus)*.

This forest zone is a minor plant community at Lake Roosevelt National Recreation Area in relation to the previous two zones. Yet it provides an additional environment/habitat with important resource values at Lake Roosevelt National Recreation Area. It occurs along the northern portion of Lake Roosevelt National Recreation Area, especially on north aspects and in protected draws. James Agee (1993:280) identifies four types of mixed-conifer forests in the Pacific Northwest. The one we will consider is the Douglas fir (DF) forest. In this plant community DF is the climax tree species. The DF zone at Lake Roosevelt National Recreation Area is often on the dry end of the zone and prior to 1900 this zone was probably dominated by ponderosa pine due to the presence of frequent fire (Franklin, et al., 1988:192). Various studies

in eastern Washington have shown mean fire return intervals in DF forests (in the dry end of the zone) ranging from 10 –24 years (Agee, 1993:292).

Surface fires often kill DF saplings because their low branching habit allows fire to carry into the crown. These saplings are more susceptible to mortality from surface fires than ponderosa pine saplings (Arno, et al., 1983). In general young DF trees that survive fires tend to be taller and have larger bole diameters (Bevins, 1980). It takes about 40 years for DF to develop fire-resistant bark on moist sites in the northern Rockies (Fischer, Bradley, 1987). Because they have thicker bark and larger crowns, large trees can withstand proportionally greater bole and crown damage than small trees.

DF regenerates through dispersal of winged seeds. These seeds establish on mineral soil and organic seedbeds less than 2 inches thick (Ryker, 1975. Germination begins soon after snowmelt, and seedling survival is best under partial shade.

Fire suppression has allowed the more shade tolerant DF to reinvade these sites where it had formerly been in check due to frequent fire. This increase in DF can lead to more insect and disease problems and to denser stands of trees creating a stressed forest stand. As these forests become denser the chance for a high intensity stand replacing fire increases (Agee, 1993: 294). Also "protection from fire for long periods of time increases Douglas fir in a multi-layered architecture and has been associated with increased duration and intensity of western spruce budworm (*Choristoneura occidentalis*) attack (Agee, 1993: 295)".

Continued fire suppression in the dry DF zone of Lake Roosevelt National Recreation Area may lead to dense stands of DF. The increase of DF will likely reduce the greater diversity of more open ponderosa pine and DF stands. It will also lead to increase in ladder fuels and fuel densities that can result in stand replacement fires. This increase in DF may also lead to increased disease and insect problems, which again may lead to increased mortality or low tree vigor and eventually to more intense fire regimes.

Western Larch (WL) is a seral species in the mixed-conifer zone and is part of the most moist forest plant associations within Lake Roosevelt National Recreation Area. WL is not as tolerant of summer drought as many other conifers and is generally found on north- or east facing slopes and other relatively moist sites (Arno, Hammerly, 1977). On the

whole WL is a minor forest species within Lake Roosevelt National Recreation Area.

WL is the most fire-resistant tree species in the Inland Northwest. It has very thick bark containing little resin, a high and open branching habit, deep roots, and low-flammability foliage (Flint, 1925). In the Pacific Northwest, WL serves as an indicator of previous severe fires on fair to good sites (Hall, 1973). Fire favors the establishment of WL because it quickly invades openings, grows rapidly, and needs full sunlight. This requirement of needing full sunlight limits this tree's ability to dominate a site that is invaded by more shade tolerant species such as Douglas fir. WL relies on it’s relative longevity (Franklin, 1979) to survive until the next fire comes through to create the conditions for its regeneration.

Shrub species: Snowberry, chokecherry, mallow ninebark.

Many shrub species are associated with DF and ponderosa pine plant communities. These various plants often help define the different plant associations described for these trees. As a general rule these shrubs will resprout after a fire, and often are more palatable and nutritious to wildlife than in there previous unburned condition (Saveland, et al., 1988). The following species will be briefly characterized as to there response of fire and fire suppression: snowberry, cherry, mallow ninebark.

Snowberry (SB) is a survivor of low to moderate intensity fires (Fischer, Clayton, 1983). It is shade tolerant, although production tends to decrease as overstory canopy increases (Zimmerman, 1979). Moderate prescribed fire can benefit SB. Burning from wildfire and prescribed fire can increase the abundance of SB.

Chokecherry is well adapted to fire according to generalized fire effects information (Gartner, Wesley, 1973). Although easily top-killed, CC sprouts vigorously from surviving root crowns and rhizomes (Habeck, et al., 1980). To a lesser degree, post-fire regeneration also involves the germination of off-site seed dispersed by mammals and birds (Volland, Dell, 1981).

Mallow ninebark (NB) sprouts vigorously following fire. Sprouts originate from horizontal rhizomes, of which a high proportion are situated in mineral soil. NB has 36 to 99 percent of its rhizomes buried in mineral soil, ensuring its potential for survival and sprouting following a fire. It has been ranked in the highest fire-survival

category in a western Montana study (Bradley, 1984; Crane, Fischer, 1986; Noste, Bushey, 1987) .

Noxious Weeds

Bromus tectorum cheatgrass, *Centaurea diffusa* diffuse knapweed. Lake Roosevelt National Recreation Area has over 15 exotic noxious weed species although these two species are by and large the most common. Cheatgrass is common throughout Lake Roosevelt National Recreation Area, especially in the steppe/shrub steppe habitats. Knapweed is common through out the northern half of Lake Roosevelt National Recreation Area.

Cheatgrass (CG) is an exotic invasive annual grass species, favored by disturbance such as overgrazing, cultivation, or frequent fire. Cheatgrass effectively outcompetes native vegetation when cover of these species has been reduced (FEIS, *Broumus tectorum*) . As CG is an annual and survives fire by seed source that is available in the unburned duff.

CG is also very flammable and dries out up to 6 weeks earlier than the native perennial grasses (Stewart, 1949). Large stands of CG, relative to the abundance of native grasses, can create severe, frequent fires that cause the native grasses and shrubs to decline. Although wildfire can reduce seed production and set back plant density in the short term, surviving plants quickly take advantage of open seedbeds and often out compete native species.

Diffuse knapweed (DK) resists low-severity fire because of its stout taproot. DK can resprout from these taproots or from seeds buried in the soil or from off-site sources. Seeds buried in the soil probably survive most fires (FEIS, Centaurea diffusa. Fire Ecology). If DK is the only major plant present on the site, with little or no grass cover, fire may not travel through the sparsely spread stems of knapweed. This was evidenced on a 1999 fall fire on the adjacent Spokane Indian Reservation. Severe fire conditions and wind did not burn the dead DK stems (Author observation, 10/99).

Fire will probably benefit DK by reducing competing plants such as perennial grasses. Severe fires may kill the plants and many seeds but surviving seeds or plants surviving within or adjacent to the perimeter of the fire can re-invade the site quickly if surviving native vegetation is reduced or non-existent.

(Plants) Alternative B – Preferred Alternative) – Suppression of all wildland fire, use of Mechanical Treatment, and use of prescribed fire to achieve resource objectives.

The preceding discussion of fire effects on the plant communities of Lake Roosevelt National Recreation Area also applies to implementation of Alternative B. Wildland fires will occur regardless of which alternative is selected. Alternative A's policy of a full suppression response to all wildfires will be applied to Lake Roosevelt National Recreation Area under this alternative as well. The addition of prescribed fire will begin to help reduce the chance of severe stand replacing wildland fires in the future.

Steppe/shrub-steppe zone

This alternative provides the greatest potential to control wildfires in steppe/shrub-steppe ecosystems while at the same time providing for the maintenance of these communities through the use of prescribed fire. The use of periodic prescribed fire will maintain the integrity of steppe/shrub-steppe plant communities and the wildlife species dependent upon them for habitat. With the practice of fire exclusion in eastern Washington since the early 1900's many steppe/shrub-steppe areas have been lost to encroachment by ponderosa pine. This fire exclusion has also reduced the value of many shrub species for wildlife use. In areas of fire exclusion increased fuel loads could lead to more intense fires in the steppe/shrub steppe.

Although the effects of fire on the major plant species was given in Alternative A. A brief summary or statement will be given concerning the effects of using prescribed fire on these species:

Bluebunch wheatgrass regenerates vegetatively following fire. Prescribed fires timed outside of spring during the major growth do not typically kill bluebunch. Although the fire can reduce the crown basal area (Eugene, 1966), it can benefit the plant by reducing a buildup of thatch and eliminate encroachment by various shrub and tree species. Fire increases nutritional value and plant vigor.

Idaho fescue can survive low to moderate severity fires if timed in early spring or late fall (Beardall, et al., 1976). The timing of a prescribed fire could benefit stands of Idaho fescue and the reduction in clump size may also protect the plant from future fires (Wright, 1985). Prescribed fire could also eliminate encroachment from trees and shrubs.

Needlegrasses are among the least fire resistant of the bunchgrasses (Wright, et al., 1979). Consumption of above ground vegetation will often kill this grass species or leave a few culms that will take up to 3 to 8 years to recover to pre-burn levels (Wright, et al., 1979). Regeneration is by seed. Use of prescribed fire in the spring or late fall will likely lead to the least damage to needlegrasses, although some damage will be expected. A benefit of prescribed burning to Needlegrasses is the reduction in the buildup of high fuel loads that can lead to greater mortality of the plant during future fire (Wright, et al., 1979) .

Big sagebrush is easily killed by fire. Prescribed fire will likely have a detrimental effect on big sagebrush. Recovery is from seed and big sagebrush reinvades sites by germination of soil-stored or off-site seed. The severity and size of the fire determines the overall impact to sagebrush. A benefit of prescribed fire, seen by other plants, will be the reduction in fuels that will help protect big sagebrush from future fires. Prescribed fires should be patchier, contributing to more available seed sources for seed dependent plants.

Threetip sagebrush will possibly benefit from prescribed fire. Threetip sagebrush was noted by Volland (1981) as being a weak sprouter from the stump following fire. Prescribed fire can benefit this plant by timing the fire at a time that will be least damaging to threetip sage. Also the subsequent reduction in fuels around the plant will protect it from future fires.

Common rabbitbrush as a seral species will likely benefit from prescribed fire. As above for threetip sage, if the prescribed fire is planned at a time to reduce the fire intensity then rabbitbrush is able to resprout from buds on or near the stem base. Also surviving plants within and along the perimeter of the fire can readily re-seed the burned area. In areas where the native understory grass component is intact rabbitbrush reproductive output will be limited by competition.

Antelope bitterbrush is often killed by fire, and literature notes high mortality occurs to plants with an erect growth habit. It is likely that any fire will have a detrimental impact of bitterbrush at Lake Roosevelt National Recreation Area. Prescribed fire will impact bitterbrush, but the timing of fires can be used to reduce the severity of fires, thus reducing the impacts on bitterbrush. Prescribed fire will also reduce other fuels levels which will protect the plants from severe wildfires. Low to moderate intensity prescribed fires will provide more patchy effects, resulting in more seeding opportunities in burned areas.

Transition Forest Zone

Ponderosa pine is considered a fire dependent species. Prescribed fire will typically benefit ponderosa pine. The benefits to this species will be: the reduction in stem density of regenerating pine; temporary reduction of understory shrubs, that will free up nutrients for ponderosa pine; reduction of ground and ladder fuels, that will protect ponderosa pine from more severe fires; limbing of trees that may be infected with dwarf mistletoe; and creation of mineral soil patches for tree regeneration.

As described above some of the trees currently growing at Lake Roosevelt National Recreation Area may be fire sensitive due to the previous lack of fire that typically killed these trees when they were younger. Many stands at Lake Roosevelt National Recreation Area may also need some mechanical fuel treatment accomplished before they can be entered with fire. The resource objective for each zone will determine the level of treatment needed.

Mixed Conifer Zone

Increased Douglas fir regeneration has been successful in Lake Roosevelt National Recreation Area due to past fire exclusion. In many areas the objectives of prescribed fire will be to eliminate an understory of younger Douglas fir trees. Some of LRNRA's forests are on the dry end of the mixed-conifer forest zone so that with fire exclusion they have begun to replace the major seral ponderosa pine. Dry conditions in these stands can often lead to increased disease and insect damage.

The increase of Douglas fir in the understory also creates a fuel ladder in the forest canopy. By removing these ladder fuels in a controlled fashion, by the use of prescribed fire, future catastrophic fires can be avoided. The reduction of this understory will likely stimulate other plant components such as grasses and shrubs. This will increase the diversity and wildlife habitat value for more species. Mature trees should not be killed by prescribed fire, as they have developed fire-resistant bark. Mortality can be somewhat mitigated by prescribed fire, depending on fuel loading.

Western Larch is a very minor component of LRNRA's forests. As it is considered the most fire-resistant tree species in the Inland Northwest, existing western larch trees will likely not be impacted by prescribed fire. Benefits to western larch will dependent on severity of

fire. Studies in Montana have shown numerous 3-year-old western larch seedlings following a hot fire but very few on lightly burned areas (Stark, 1977). Western Larch can also benefit from reduction of ladder fuels that can carry fire into the crown of the tree.

Snowberry sprouts vigorously from it's rhizomes; it sprouts less vigorously from its root crown. Snowberry rhizomes can survive low- to moderate-intensity fires but may not survive severe fires (Crane, et al., 1986). Prescribed fire can benefit snowberry (Merrill, 1982) by reducing fire severity and encouraging younger age classes of shrub communities in mosaic patterns.

Noxious Weeds

Noxious weed problems can be exacerbated by ground disturbing activities such as fire and mechanical treatment of vegetation. In areas that require further mechanical treatment Noxious weeds will be surveyed to determine the frequency of weeds present before ground disturbing activities. If weeds are found to be present measures will be implemented to help avoid spreading and increasing the abundance of the weeds present. Measures such a persistent cleaning of equipment, low ground disturbance, avoidance of areas by equipment will be used to reduce the chance of increasing weed problems.

Fire is also a potential force to greatly increase noxious weed spread. Before each burn surveying for weed will be done to determine the weeds present and their abundance status. Depending on the amount and type of weeds present strategies will be adopted to burn at a time that is the greatest disadvantage to the noxious weed. If burning is determined to be a potential problem to greatly increase the weed problem in an area, other strategies may be needed to treat the weeds before fire is introduced.

Cheatgrass as noted above is able to re-establish after fire by the survival of its seed. Fire also benefits cheatgrass by eliminating or reducing native perennial grass competition. Merrill, et al. (1980) found no increase in bluebunch wheatgrass under ponderosa pine after a fall wildfire, but initial increases in cheatgrass height returned to preburn conditions after four years. This suggests that in areas dominated by cheatgrass, fire cannot be used to restore native conditions.

It has been noted by studies completed at Scott's Bluff National Monument that spring prescribed fire could reduce the new seedlings

and some of the surface seed source. Repeated spring burns could reduce cheatgrass density and standing crop (Butterfield, et al. 1996). Reduction of cheat grass in areas with an Idaho fescue seed source could benefit Idaho fescue that can survive low severity spring fires (Beardless, et al., 1976).

Diffuse knapweed - Prescribed burning in areas infested with diffuse knapweed and related knapweeds will have to be monitored closely. Information is somewhat lacking regarding fire effects to diffuse knapweed. Low severity fires may allow survival of knapweed taproot, while reducing competitive vegetation. Seeds may re-sprout after low severity fires.

Prescribed burning has been shown to be an effective control of diffuse knapweed with strong grass regrowth occurring on burned sites (Zimmerman, 1997; Watson and Renney 1974) . Within two years of burning, most diffuse knapweed rosettes were eliminated (Zimmerman 1997). This presumes that there is a component of native grasses to re-establish on the site. Re-seeding desirable species in areas without a large native grass component may be necessary following burns to deter re-infestation by diffuse knapweed or other exotic species. In an area in Northeastern Washington where a native cover of grass was present before control, addition of nitrogen fertilizer helped tip the scale in favor of the grasses on a site recently controlled by herbicides (Roche, 1988).

Wildlife

(Wildlife) Alternative A – Alternative A – (No Action) – Continue Full Suppression of ALL Wildland Fires, use of Mechanical Treatment, and no use of Prescribed Fires.

Fire effects on wildlife are complex because they are often indirect, affecting habitat more than individuals. Some species tend to be "winners" and others "losers" as fire alters the habitat. Many species, common to Lake Roosevelt National Recreation Area are favored by habitat changes that reduce forest cover or increase edge: moose, deer, elk, mountain lion, coyote, black bear, beaver, turkey, pheasant, ruffed grouse, blue grouse, and some waterfowl (Agee, 1993:178). Others such as the red squirrel are reported to decrease after burning (Agee, 1993:178).

The configuration of Lake Roosevelt National Recreation Area, as previously discussed, precludes the opportunity for large fires within

the area, although larger fires can move up slope out of the area. This configuration precludes large acreage's to burn in Lake Roosevelt National Recreation Area. With this in mind, the effects to most large animals should be minor, as adjacent unburned areas will be available for migration of animals. Due to the small area managed by Lake Roosevelt National Recreation Area, all wildland fires will be suppressed.

Mammals: mule deer, white-tailed deer, coyotes, badger, raccoon, red squirrel, deer mouse.

Mule deer can be trapped and killed by fast-moving fires, although uncommon (FEIS, *Odocoileus hemionus*: Fire effects and use). In general, fires that create mosaics of forage and cover are beneficial for deer (FEIS, *Odocoileus hemionus*: Fire effects and use). Also fire rejuvenates and improves grasslands, which are important winter range in some areas (Johnson, 1989). However, in areas where sagebrush is the only cover, its complete removal can be detrimental to mule deer populations (USDA, 1973). A major impact of fire at Lake Roosevelt National Recreation Area is the loss of antelope bitterbrush. This is a highly preferred browse species and is sensitive to burning. Loss of this species will be one of the greatest impacts to deer. Many other shrubs that provide browse for deer will be stimulated by fire if the intensity and severity are low.

White-tailed deer as well are rarely killed by fire (Bendell, 1974). Like mule deer, patchy burns that create a mosaic of browse and cover are usually beneficial to whitetail populations. As mentioned above a major impact of fire at Lake Roosevelt National Recreation Area is the loss of Antelope Bitterbrush. This is a highly preferred browse species and is sensitive to burning. Loss of this species will be one of the greatest impacts to deer. Many other shrubs that provide browse for deer will be stimulated by fire if the intensity and severity are low

Coyotes are very mobile and probably escape most fires. Fires that reduce vegetation height and create open areas can increase hunting efficiency by coyotes but may reduce prey species such as jackrabbit, habitat. Surface fires often open substrates for quieter stalking and easier capture of prey than can occur in closed forests (FEIS, *Canis latrans*,38).

Raccoons are very mobile and probably escape most fires. Effects of fire are more variable for raccoons. Loss of cover can be detrimental to raccoons, as can the loss of plants that provide fruits. In studies in

California raccoons benefited from early and mid seral chaparral and grassland systems (FEIS, *Procyon lotor*, fire effects, 25).

Red squirrel. Important habitat for red squirrels includes mature trees unlikely to be adversely affected by low-severity fire. Severe fire would have negative impact on red squirrels due to the loss of large trees and their associated canopy. Although in most areas squirrels may be able to move to new areas, this would be a negative impact. Fires in the ponderosa pine forest may in some areas create a more open, spread out canopy that would not be suitable for red squirrels.

Badgers are able to survive fires by burrowing in the ground. The most important effect of fire on badger habitat is its effect on prey populations. Badgers probably leave a burned area if rodent populations decline; however some rodents increase on fire-disturbed areas, making it likely that badger activity would also increase in those areas. If the prey base was decreased, badgers can move to new areas of more abundant prey populations (*Taxidea taxus,* fire effects and use). Pocket gophers, which are a major prey item for badgers in western North America, often increase on lands disturbed by fire (FEIS, *Taxidea taxus,* fire effects and use, 29).

Deer mouse can be killed by direct mortality due to fire, and due to predation, loss of food supply, etc. Many survive by moving into underground burrows. Deer mice increased in a ponderosa pine forest in Arizona after fire. The increase was attributed to increased food and cover in the form of stumps and fallen logs; the highest populations occurred in areas with significantly more cover and forbs (FEIS, *Peromyscus maniculatus,* Fire effects and use, 75). In other studies deer mice in grasslands tend to use burned plots more than adjacent unburned plot (FEIS, *Peromyscus maniculatus,* Fire effects and use, 90).

Birds

Adult birds can generally escape wildfires and move to areas not impacted by the fire. Major impacts to birds from wildfire include: interruption of nesting, death of baby birds in the nest (McMahon, et al., 1990:241), alteration and loss of preferred cover; and drastic change in habitat structure. Generally speaking large, intense fires that burn an area clean may not have any clear benefit to (steppe) wildlife species in the short term (Clark, et al, 1990:88).

Impacts to raptor species should be limited to ground nesters, impacts to burned nest and roost trees and negative affects to prey species habitats. Fires are noted to have effects on golden and bald eagles, which are impacted by severe fires that destroy nest and roosting trees. Regular burning helps to keep habitats in a suitable condition for many prey species of the golden eagle and increases hunting efficiency (Landers,1987). These same general impacts are reported for red-tailed hawks (Landers, 1987), great horned owls (Lehman, 1989), and osprey (FEIS, *Pandion haliaetus*, Fire effects and use). Some species have been adversely affected by fire suppression, such as the prairie falcon (Lehman, 1989) in which trees have encroached on grassland habitats, whereas some have benefited, such as red-tailed hawks (Palmer, 1988), where trees have moved into vast treeless grassland areas. Peregrine falcons can benefit from low to moderate intensity fire that creates a mosaic of habitat for its prey species (FEIS, *Falco peregrinus*, Fire effects and use).

Passerine birds, like other birds can escape fire, but if the fire occurs during nesting negative impacts can occur. Some research has shown black-capped chickadees decrease following fire, probably due to a decrease in habitat complexity and available food (Niemi, 1978). Burning can lead to increased ground nesting by morning doves (Soutiere, et al. 1973) which may make future nests more vulnerable to fires. Conversely mourning doves have been found to prefer burned areas for feeding (Mason, 1981), indicating that a mosaic created by a low to moderately severe fire could benefit this bird. Western bluebird's nest’s and nestling are probably vulnerable to fire (Nichols, et al. 1984). Once again post-fire communities are usually attractive to western bluebirds (Saab, 1995).

Woodpeckers are likely to benefit with fires that create additional snags and retains existing snags. Generally speaking fire can benefit or degrade a species based on the severity of the fire and on what type of habitat is affected compared to the preferential habitat of the species in question.

Fire effects to water birds can be detrimental to the species in that many nest in grass or grass like vegetation which readily burns. The main impacts to waterfowl is the loss of nest and nestlings in the spring nesting period and this includes: mallards (Hodson, 1965), Canada geese (FEIS, Branta canadensis, Fire effects and use. 2000), Northern pintails and blue-winged teal (Bellrose,1980). Adult waterfowl could be affected if a fire occurred during molting. Fire has other notable benefits and impacts to ducks, these include: reduction

of predator cover (Fritzell, 1975), creation of more nesting materials and areas (Vogl, 1967), and reduction of the vegetation's ability to hold snow and thus recharge spring ponds (Ward, 1968).

Gallinaceous birds are also very vulnerable to fire because many nest on the ground in grassy, shrubby vegetation. As with other ground nesters the adults can escape fires but the young and associated nests can be destroyed by early spring fires. This includes the following gallinaceous birds: chukar (Bohl, 1957), ruffed grouse (Grange, 1948), wild turkeys (Hurst, 1981), and sharp-tailed grouse (Grange, 1948). Like other grassland and ground related birds fire can benefit these birds in the following ways: turkeys and chukar by reducing ground cover exposing seeds and dead insects, an important food source (Wright, 1982), (Hurst, 1978); reduce ground cover that in turn reduces predator cover and makes it easier for these birds to travel along the ground. . Increasing diversity in plant communities can increase food sources for these birds (forbs and insects).

The impacts of fire on birds vary according to the timing, severity, location, and extent. Generally speaking lower intensity fires that create a mosaic of habitats tend to benefit the greatest number of species, based on the previous discussion. Large, severe fires will have the greatest impacts on the most species overall. Fire suppression without additional prescribed burning may lead to larger impacts to birds on the landscape.

Reptiles and Amphibians

Little information was available to determine the impacts of fires on reptiles and amphibians. Komarek (1969) reports that experiments with different types of prescribed fires resulted in no discernible amphibian mortality. Western toads were found in slightly higher abundance in early succession stages of Douglas fir forests (Raphael, 1988). These species are thought to be able to escape low severity fires by hiding in the soil beneath rocks, logs, or wet leaves; in animal burrows; or by escaping to water (FEIS, *Bufo boreas*, fire effects and use). It is reported that the fact that no reports of high mortality for any herpetile species may indicate that amphibians and reptiles are not highly vulnerable to fire (Means, et al., 1981).

Fisheries

As reported by Walstad, et al. (1990) the major impacts of fire on fish involve impacts of increased water temperature, increase in nutrients,

decreases in large woody debris, and sedimentation and turbidity. Most of these conditions already exist for the main stem of the Columbia, lower Spokane, Lower Kettle and Lower Colville rivers due to reservoir operations or they never existed. Another element is the fact that Lake Roosevelt National Recreation Area manages very little creek length along each reservoir tributary. An average of 19 creeks (many of these may not bear fish) at Lake Roosevelt National Recreation Area revealed that the average creek reach was just over 700'.

Generally Lake Roosevelt National Recreation Area manages a very small distance on tributary streams, excluding the Spokane, Kettle and Colville Rivers. The Columbia River shoreline from Grand Coulee Dam to the Canadian border, including creek mouths and Islands, is roughly 660 miles in length (Payne, et al. 1974). This includes roughly 15 miles of river that falls out of LRNRA's boundary. With this tremendous distance of shoreline, one would think that the abundance of riparian vegetation would be very large. Unfortunately due to the operation of this large reservoir, much of the riparian zone is missing. This is due to the harsh wet/dry environment along the river shoreline. Riparian vegetation often has difficulty developing due to the desiccation and drowning of vegetation as the water level fluctuates. Another important characteristic of the reservoir is a large amount of shoreline that is in an active slumping/erosional state. Pleistocene sedimentary deposits, along the reservoir, have been de-stabilized by the constant and dramatic fluctuations of up to 80 feet annually. These unstable shorelines also preclude riparian development.

With this in mind it is thought that fire, within LRNRA's boundary has little potential to create large impacts to fish species relative to the actions that are already occurring along the shoreline. Fire in Lake Roosevelt National Recreation Area will have minimal impact to tributaries due to the fact that very short distances are contained within the boundary. On many of these creeks the watersheds are being impacted by other land use practices out of the NPS's control. The greatest impact to fish would occur if a small fire on Lake Roosevelt National Recreation Area escaped to adjacent land and ended up burning a large portion of the tributaries watershed. Continued absence of fire could potentially lead to increased chance of a severe fire escaping the Lake Roosevelt National Recreation Area boundary.

(Wildlife) Alternative B – Preferred Alternative) – Suppression of all wildland fire, use of Mechanical Treatment, and use of prescribed fire to achieve resource objectives.

As described earlier, the impacts of wildfire will be the same as described in Alternative A, particularly near the beginning of a prescribed fire program. As areas are burned with prescribed fire, the impacts of future fires that pass through these same areas will be reduced. In general the small scale prescribed fires proposed at Lake Roosevelt National Recreation Area should not have long lasting impact on any one species. Like other forest disturbances, fire (at least at the scale of typical prescribed fires) seems to have negligible impacts on species abundance and diversity. Some species disappear from burned areas, while others appear which were absent prior to fire (McMahon, et al, 1990:244).

Mammals

Mule and whitetail deer will likely benefit overall from prescribed fire due to the mosaic created by fire which tends to stimulate growth and nutrition of preferred forage plants. Prescribed fire will also reduce the chance for catastrophic fire by reducing existing fuel loads. A major impact to deer will be the loss of antelope bitterbrush. Prescribed fire is likely to reduce some bitterbrush thus negatively impacting deer and other animals that forage on it. Prescribed fire can be used in such a way as to minimize negative impacts. This will protect some bitterbrush by reducing the fuel loading that in turn will reduce future severe fires.

Coyotes will likely benefit from prescribed fire. One of the primary benefits to coyotes will be the opening up and thinning out of ground vegetation. This often improves the hunting efficiency by coyotes. Mosaics created by prescribed fire will maintain thermal and hiding cover for prey species.

Raccoons appear to benefit most from fires that are not severe and create a mosaic of habitats that provide cover and improved foraging. Prescribed fire may benefit raccoons by creating a mosaic typical of a lower severity fire. Another benefit again will be the reduction in the chance for a severe wildfire, which may destroy large amounts of cover vegetation required for raccoon survival. If prescribed fires become severe they may tend to temporarily eliminate some fruit related resources that are important food for raccoons. But as many of these plants require openings to reproduce, eventually areas may

recover back to pre-fire levels, or even exceed previous growth (Hon, 1981).

Red squirrels may see negative impacts from prescribed fires. One of the eventual goals of prescribed fire in the ponderosa pine forest will be the reduction in forest stem densities. This may create a more widely spaced tree canopy, that does not favor this tree squirrel. In Yellowstone National Park lodgepole pine stands monitored for presence of birds and mammals during post-fire succession, red squirrels were only present in stands with closed canopies (Taylor, 1974). In areas where tree canopy cover is contiguous, effects of prescribed fire will become minimal.

Fires that reduce their major prey species can negatively affect badgers. It has been noted in southwestern Idaho, wildfire reduced the abundance of small mammals in the first year after the fire. In the same year, badger numbers were lower on burned sites than on adjacent unburned sites (Groves, et al., 1988). In another report pocket gophers, a major prey species for badgers, increased on lands disturbed by fire (Teipner, et al.,1983). This indicates that prescribed fire could have good and bad effects on badgers depending how severe the fire becomes. Overall there will probably be a benefit, as prescribed fires will be introduced gradually to Lake Roosevelt National Recreation Area, creating a mosaic of vegetation, which will likely benefit badger prey species and thus benefit badgers.

Deer mice will likely be negatively impacted in the short term by prescribed fire due to the presence of loose ash or lack of food. Reports vary on the overall response to fire. The FEIS database reports show beneficial, deleterious, and neutral benefits to deer mice. It is noted that deer mice are often the first animals to invade an area that has been burned (Forde, 1983). Since prescribed fire at Lake Roosevelt National Recreation Area will be introduced gradually, deer mice will probably not be negatively affected by fire. Also reductions of fuels by prescribed fire will reduce future fire intensities.

Birds

Birds can potentially be impacted by prescribed fire at Lake Roosevelt National Recreation Area. Presumably some prescribed fires will occur during the spring nesting periods and thus could cause nest abandonment or outright mortality of nestlings. Impacts to adults are expected to be low, except for the loss in productivity. Some of the

overall impacts to birds will be minimized by the relatively small size of proposed burns at Lake Roosevelt National Recreation Area.

Prescribed fire in raptor habitats usually does not conflict with raptor habitat objectives and can in many cases be beneficial (Lehman, 1989). Low-severity fires, such as those proposed by Lake Roosevelt National Recreation Area, probably have little direct effect on golden eagles (Landers, 1987). In fact if fires are kept to a low severity, they may benefit golden eagle prey. These benefits generally will apply to red-tailed hawk, prairie falcon, peregrine falcon, and great horned owl. Major impacts will be to ground nesters such as the northern harrier. It is possible prescribed fire will destroy an occasional harrier nest. Also some reports in FEIS suggest that post fire conditions are not always beneficial to the harrier. If prescribed fires become too intense or severe and destroy older trees, then negative impacts can be expected for raptors. Loss of large trees means loss of nests and roosting sites. Known nest trees will be protected prior to any prescribed fire ignition. Smoke may also have a negative impact on nesting raptors. Overall the small size and timing of planned ignitions should limit the negative impacts to raptors while often benefiting their prey.

Passerine birds are generally able to escape fire. The largest expected impact will be to ground, shrub and small tree nesting birds. Post fire conditions from proposed low severity prescribed fires should benefit many passerine birds. These fires will help create mosaics that will increase the "edge effect" that benefits many bird species. Also controlled prescribed fires will reduce the chance of severe fires which could have a negative impact on bird cover. Loss of cover is detrimental to small birds by leaving them vulnerable to raptors, especially in large, severe fires, which leave few unburned refuges. Western bluebirds benefit from post fire conditions which open up preferred feeding areas and creates snags suitable for nesting (Saab, 1995). Gray cat birds show a middle of the road response to fire. With high intensity fire (that removes all cover) or with no fire (in which cover becomes to thick) they tend to decline, with moderate fire that creates more "edge" habitat and more complex habitats, they seem to benefit (FEIS, Dumetella carolinensis, Fire effects and use). Finally, black-capped chickadees tend to show a slight negative response to fire. Fire can negatively impacts chickadees due to a decrease in habitat complexity and available food.

Impacts to waterfowl by prescribed fire are expected to be minimal at Lake Roosevelt National Recreation Area. Major fire impacts include

destruction of nests and nestlings during spring burns. Prescribed fire units at Lake Roosevelt National Recreation Area can be planned in such a way to minimize the impact to nesting waterfowl. Nesting areas will be protected during the planning stages of prescribed fire. Some disturbance to the nest may occur from this activity as well as from smoke, but many waterfowl species are known to return to burnt nests and try to hatch baby birds if they survive the fire (Hodson, 1965), (Leedy, 1950). Fires are also known to reduce fine ground vegetation which can benefit waterfowl in predator detection (Fritzell, 1975).

Like other birds, gallinaceous birds can benefit and be negatively impacted by prescribed fire. These birds are ground nesters so their nests and young will be destroyed by fire. Benefits to these birds include the reduction of ground cover, which in turn reduces a predator's ability to hide from these birds. The reduction of ground cover also improves these birds' abilities to move along the ground. Obviously a severe fire will remove too much cover, reducing the cover needed for these birds to hide, etc. Low to moderate intensity fires creates mosaics, which increases diversity and forage.

Reptiles and Amphibians

Published information regarding fire impacts to amphibians is not readily available. The FEIS system only listed two amphibian species and 3 reptile species (none of the reptiles were native to Lake Roosevelt National Recreation Area). One author suggested that the fact that there are no reports of high mortality for any herpetile species might indicate that amphibians and reptiles are not highly vulnerable to fire. The proposed prescribed fires will not likely include a large portion of wet or riparian habitats so thus will not have many affects on amphibians. Reptile habitats are more likely to be impacted. Prescribed fire may improve prey species for reptiles but reduce cover as well.

Fisheries

As noted fire can negatively impact fish species. The prescribed fire proposed for Lake Roosevelt National Recreation Area is not expected to impact fish species in a negative way. Lake Roosevelt National Recreation Area controls only short "mouth" portions of small tributaries, so prescribed fire will have little impact to raising the temperature of these streams. Present conditions on the main stem and tributary mouths of Lake Roosevelt National Recreation Area are already impacted by reservoir conditions that preclude significant

additions to factors that negatively impact fish. Prescribed fire at Lake Roosevelt National Recreation Area should have minimal impact on fish. A benefit may occur will be the reduction of fuel conditions on Lake Roosevelt National Recreation Area that could lead to a high intensity and severe fire that would leave the NPS boundary and move up onto private land and negatively impact the watershed of a small tributary.

Sensitive species

(Sensitive species) Alternative A – Alternative A – (No Action) – Continue Full Suppression of ALL Wildland Fires, use of Mechanical Treatment, and no use of Prescribed Fires.

Sensitive plant species

U.S. Fish and Wildlife Service listed the Ute ladies'–tresses (*Spiranthes diluvalis*) as a threatened species in 1992. Populations of the plant were located in Idaho and Washington in 1996 and 1997 in habitats similar to those found in eastern Washington and in Lake Roosevelt National Recreation Area. As a result of the potential for this species to occur at Lake Roosevelt National Recreation Area, all proposed management activities, including prescribed fire, require consideration of the potential for this species occurrence.

The Ute ladies'-tresses is a perennial, terrestrial orchid with stems approximately 10 to 20 inches tall, which flowers in late summer with spirals of small white flowers arranged in a terminal spike of inflorescence. This species primarily occupies riparian habitat along stream banks, wetlands and flood plain areas disturbed by early season high water flow. These flood disturbances create open areas suitable for early successional plants that require conditions with less competition from other plants. Most of these areas within Lake Roosevelt National Recreation Area are dominated by invasive reed canary grass or dense stands of ponderosa pine and associated riparian shrubs, creating little opportunity for open riparian areas with disturbed soil surface.

Another limiting factor in Lake Roosevelt National Recreation Area is that the main-stem of the Columbia and associated tributaries has been intersected at mid-slope by the reservoir. This condition has drastically reduced the floodplain zone, especially in the area near the dam, which is the most suitable area from a climate, ecosystem standpoint. Many creeks enter the dry part of Lake Roosevelt National

Recreation Area in a steep "V" shaped valley that limits the opportunity for a floodplain. Floodplain conditions at the tributary mouths are inundated by the reservoir at full pool.

When mechanical treatment units are proposed in the non-treed portion of the park the area will be analyzed to determine if suitable habitat conditions exist for Ute ladies'-tresses. If suitable habitat is found to be present surveys by a qualified botanist will be conducted to determine the presence of this species. Based on these conditions the National Park Service at Lake Roosevelt National Recreation Area believes that this alternative will have "no effect" on Ute ladies'-tresses.

Sensitive animal species

Use of Lake Roosevelt National Recreation Area by bald eagles includes nesting, foraging, perching, and roosting, as well as all other elements of a bald eagles life cycle. In the drier portions of the Inland Northwest, such as Lake Roosevelt National Recreation Area, bald eagles make use of the large old growth ponderosa pines that line the shoreline. These old trees provide an open or dead crown and typically have a commanding view of their surrounding. Most often bald eagle nests are found within the top 20 or 30 feet of the tree (Pacific Northwest Bald Eagle Recovery Plan, 1986). Wintering eagles normally roost within a couple hundred yards of the water's edge. Lake Roosevelt provides habitat for a large number of year-round and wintering bald eagles.

Mid-winter bald eagle surveys conduct in December, January, and February each year count upwards of 300 wintering bald eagles in Lake Roosevelt National Recreation Area. The prime period is from late December through late February. Most wintering bald eagles depart Lake Roosevelt National Recreation Area by mid-march (Lake Roosevelt National Recreation Area Files, 2000). The preferred trees used by wintering eagles usually consist of large old growth ponderosa pine or snags along the shoreline. Under this alternative these trees will continue to be threatened by the continual build up of fuels created by fire suppression. As these fuels build up, fires that are ignited at Lake Roosevelt National Recreation Area may become more severe leading to stand replacement fires that may damage or destroy preferred roosting trees. As wildfires occur outside the active winter roosting period, loss of roost trees will not have any direct effects on wintering eagles at Lake Roosevelt National Recreation Area.

In 1999 six of the nineteen active nests on Lake Roosevelt occurred on NPS managed land (Murphy, 1999). As mentioned above, bald eagles select large old growth trees or snags near the lake. These trees may be threatened by increases in fuel buildup due to fire suppression. As these fuels build up, wildfires that are ignited at Lake Roosevelt National Recreation Area may become more severe leading to stand replacement fires that may damage or destroy preferred roosting trees. If this alternative is selected Lake Roosevelt National Recreation Area will need to mechanically treat fuels near nest and roost trees to reduce the threat to these trees from future fires. Treatment activities will not occur during the estimated nesting period of January 1 – August 31. Per recommendations of the Pacific Bald Eagle Recovery Plan (1986) operational activities in adjacent areas will be outside of the recommended 400 meters (or 800 meters line of site) to avoid disturbing nesting eagles.

The preferred period of mechanical thinning treatments of trees are timed to take advantage of frozen ground and snow cover that in turn avoids damage to soil and cultural resources. This usually occurs in late December and January. Intermittent thinning in potential winter communal roosting areas may occur during this period. This timing conflicts with the recommended avoidance times for winter-roosting bald eagles, November 15 – March 15. To mitigate this the NPS will conduct a survey of winter communal roosts on Lake Roosevelt National Recreation Area managed lands. Identified communal roosts will be avoided per the above recommendations of a 400-meter buffer (or 800 meters line of site). If thinning activities will occur within the 400 meter buffer they will be conducted outside of the winter roosting period and will utilize prescriptions that will reduce ladder fuels around the communal roost areas and remove small trees, thus freeing up resources for the remaining older growth roosting trees and reducing potential damaging fuel loads.

During wildfire events at Lake Roosevelt National Recreation Area, known nest sites will be protected from fire if conditions allow. As most wildfires would occur outside of nesting periods, and typical fires would be small along the shoreline, effects to nesting eagles would be non-existent. Based on this information and these proposed actions Lake Roosevelt National Recreation Area believes that this alternative will have "no effect" on bald eagles.

Bull trout have been captured 3 times since the inception, in 1988, of the Lake Roosevelt fisheries monitoring program (Underwood, 1997). It is believed by Underwood and Sholtz (1997) that biological

conditions in Lake Roosevelt, such as temperature, are not suitable for the presence and reproduction of bull trout. Based on intensive year around surveys for over 12 years, only 3 bull trout have been captured. They believe that these individuals were likely washed down from upstream reservoirs or tributaries. They do not believe that these species would be able to survive summer temperature conditions in the reservoir. Based on this extensive information and local fishery biologists knowledge of bull trout ecology, the National Park Service believes that this alternative will have "no effect" on bull trout in the Columbia River System.

Use of Lake Roosevelt National Recreation Area by grizzly bears is not expected. The core area for grizzlies in eastern Washington is between 30 and 100 miles to the east and north and separated by numerous mountains and valleys. Most of the valleys between the core area and Lake Roosevelt National Recreation Area are inhabited by a rural human population with houses and small ranches. In Lake Roosevelt National Recreation Area the areas nearest the recovery area have roads paralleling the federally managed land on both sides of the Columbia and Kettle Rivers. Two state highways, 25 and 31 and portions of highways 20 and 395 are also between Lake Roosevelt National Recreation Area and the core recovery area. Also many of the mountainous areas are roaded and receive human use throughout the year. As grizzlies typically need large tracts of wilderness to support their populations, Lake Roosevelt National Recreation Area is not immediately adjacent to such an area. LRNRA’s land base is so thin along the reservoir that no significant effects would occur to the grizzly populations of Eastern Washington. The land surrounding Lake Roosevelt National Recreation Area has roads, houses, ranches, agricultural fields, and small communities. In considering this information this alternative will have "no effect" on grizzlies in the Selkirk grizzly population of northeast Washington.

Use of Lake Roosevelt National Recreation Area by gray wolves is not expected. No wolf sightings have been confirmed at Lake Roosevelt National Recreation Area. The reasoning that follows is almost identical to the discussion for Grizzly bears. Wolf populations in northeast Washington are small and probably transitory in nature near Lake Roosevelt National Recreation Area. Most of the valleys in the Lake Roosevelt National Recreation Area area are inhabited by a rural human population with houses, small ranches and dogs. Lake Roosevelt National Recreation Area has main roads paralleling the federally managed land on both sides of the Columbia and Kettle Rivers on the northern half of the area where one would expect a

possible wolf siting. Two state highways, 25 and 395 and portions of highway 20 and various county roads parallel Lake Roosevelt National Recreation Area and are between the larger more pristine forests, that may harbor gray wolves, and the land managed by Lake Roosevelt National Recreation Area. Also many of the surrounding mountainous areas are roaded and receive human use throughout the year. As wolves typically need large tracts of wilderness to support their populations, Lake Roosevelt National Recreation Area is not immediately adjacent to such and area. LRNRA's land base is so thin along the reservoir that no significant effects would occur to the wolf populations of Eastern Washington. The land surrounding Lake Roosevelt National Recreation Area has roads, houses, ranches, agricultural fields, and small communities. In considering this information this alternative will have "no effect" on the wolf population of northeast Washington.

(Sensitive species) Alternative B – Preferred Alternative) – Suppression of all wildland fire, use of Mechanical Treatment, and use of prescribed fire to achieve resource objectives.

Sensitive plant species

This action is the same as Alternative A with the addition of prescribed fire. Generally prescribed fire will not be used along streams so that riparian buffers will remain intact to protect the tributary streams and associated tributary species and processes from being impacted by fire. When prescribed fire treatments or mechanical fuel treatments are proposed in the non-treed portion of the park the area will be analyzed to determine if suitable habitat conditions exist for Ute ladies'-tresses. If suitable habitat is found surveys by a qualified botanist will be conducted to determine the presence of this species. If the plant is identified in the burn unit then these areas will be excluded from the burn unit and protected in the on the ground preparation for the proposed burn.

Based on these conditions, of generally unsuitable terrain, that the majority of prescribed fires will not be utilized in the riparian zones, and that surveys will be conducted for the presence of this plant if suitable habitat may be impacted, the National Park Service at Lake Roosevelt National Recreation Area believes that this alternative will have "no effect" on Ute ladies'-tresses.

Sensitive animal species

As wildfires will still occur under this alternative the impacts described for bald eagles in Alternative A, will apply to Alternative B as well. Intense wildfires will impact both roosting and nesting bald eagles by killing large roosting and nest trees.

Prescribed fire will generally benefit bald eagles at Lake Roosevelt National Recreation Area. As described above the benefits to wintering bald eagles will be realized in the summer, when most of them are not present. Prescribed fire will help reduce fuel buildup and reduce ladder fuels that could threaten old growth ponderosa pine trees and snags that are the preferred roosting habitat on Lake Roosevelt.

As prescribed fire will be implemented gradually, the potential impact to important roost trees will

be lessened. During prescribed fire operations actions will be taken to minimize the impact to old growth trees. Actions may include black lining around groves of large trees and snags along the reservoir; protection of individual known roost trees by mechanically reducing the fuel around the base of the tree; exclusion of certain areas from the prescribed fire.

Impacts of prescribed fire to nesting bald eagles will be dependent on location, size and timing. For those fires outside of the nesting period of January through early August (MBEWG, 1986), the use of prescribed fire will likely benefit nest trees. Prescribed fire will be used to reduce fuel loadings and fuel ladders that may lead to catastrophic fires that could destroy nest trees or potential nest trees. Also prescribed fire may also occasionally create snags that could be used as a future-nesting site. Mitigation of prescribed fires during the nesting period include not burning within 400 meters (800 meters line of site) of nests, not burning when climate conditions would send smoke into a nesting area, or mechanical reduction of fuels around nest sites (outside of nesting season) with no prescribed fire.

If Lake Roosevelt National Recreation Area needs to mechanically treat fuels near nest and roost trees to reduce the threat to these trees from future fires, treatment activities will not occur during the estimated nesting period of January 1 – August 31. Per recommendations of the Pacific Bald Eagle Recovery Plan (1986) operational activities in adjacent areas will be outside of the recommended 400 meters (or 800 meters line of site) to avoid disturbing nesting eagles.

The preferred period of mechanical thinning treatments of trees are timed to take advantage of frozen ground and snow cover, which in turn avoids damage to soil and cultural resources. This usually occurs in late December and January. Intermittent thinning in potential winter communal roosting areas may occur during this period. This timing conflicts with the recommended avoidance times for winter-roosting bald eagles, November 15 – March 15. To mitigate this the NPS will conduct a survey of winter communal roosts on Lake Roosevelt National Recreation Area managed lands. Identified communal roosts will be avoided per the above recommendations of a 400-meter buffer (or 800 meters line of site). If thinning activities will occur within the 400-meter buffer they will be conducted outside of the winter roosting period and will utilize prescriptions that will benefit the main roosting trees. This prescription will reduce ladder fuels around the communal roost areas and remove small trees, thus freeing up resources for the remaining older growth roosting trees and reducing potential damaging fuel loads.

Use of Lake Roosevelt National Recreation Area by bull trout is not expected. The above information described in Alternative A applies to this alternative as well. Prescribed fire at Lake Roosevelt National Recreation Area will not add to the expected impact to bull trout in eastern Washington. Riparian buffers where present will be protected during prescribed fire. As the proposed prescribed fires at Lake Roosevelt National Recreation Area will be small in extent and closely controlled this action is not expected to impact bull trout populations in northeast Washington. Based on this extensive information and local fishery biologists' knowledge of bull trout ecology, the National Park Service believes that this alternative will have "no effect" on bull trout in the Columbia River System.

Use of Lake Roosevelt National Recreation Area by grizzly bears is not expected. The above information described in Alternative A applies to this alternative as well. As the proposed prescribed fires at Lake Roosevelt National Recreation Area will be small in extent and closely controlled this action is not expected to impact grizzly populations in northeast Washington. In considering this information the National Park Service at Lake Roosevelt National Recreation Area believes that this alternative will have "no effect" on grizzlies in the Selkirk grizzly population of northeast Washington.

Use of Lake Roosevelt National Recreation Area by Gray wolves is not expected. The above information described in Alternative A applies to this alternative as well. As the proposed prescribed fires at Lake

Roosevelt National Recreation Area will be small in extent and closely controlled this action is not expected to impact gray wolf populations in northeast Washington. In considering this information this alternative will have "no effect" on the wolf population of northeast Washington.

Cultural Resources

(Cultural) Alternative A – Alternative A – (No Action) – Continue Full Suppression of ALL Wildland Fires, use of Mechanical Treatment, and no use of Prescribed Fires.

The effects of wildfire in this alternative may have a more devastating effect on cultural resources than Alternative B because of the greater intensity of heat penetration into subsurface sites, the complete consumption of wood artifacts and structures as a result of the hotter fire, and the more extensive suppression activities that would likely occur in wildland fire situations. While some of the disturbances caused by suppression can be avoided by careful planning of hand lines and rehab work, the ability to consider cultural resources during a wildland fire is much less likely to occur.

(Cultural) Alternative B – Preferred Alternative) – Suppression of all wildland fire, use of Mechanical Treatment, and use of prescribed fire to achieve resource objectives.

The Fire Management Plan states that all fire-management activities, particularly the development of prescribed burn plans, will adhere to the NHPA and NAGPRA. The adverse effects of fire and fire suppression activities will thus be minimized or avoided by pre-burn surveys, implementing cultural resource protection procedures (such as foaming a wood structure), and by carefully locating ground-disturbing activities away form cultural sites. However, the large number of small burn units that would be employed throughout the Recreation Area may actually result in more ground disturbance than in Alternative A. This effect may be offset somewhat by the reduction of uncontrolled wildland fires in the Recreation Area. Also areas once protected by the more dense vegetation may be exposed by prescribed fires, leaving them more vulnerable to theft and damage.

Visitor Use:

(Visitor Use) Alternative A – Alternative A – (No Action) – Continue Full Suppression of ALL Wildland Fires, use of Mechanical Treatment, and no use of Prescribed Fires.

Under this alternative visitor use would be impacted in the short-term as has occurred historically. Short-term impacts would culminate in restrictions of use by visitors in areas affected by the spread of the wildland fire event. Management actions such as visitor evacuations, entry restrictions and other strategies removing visitors from areas impacted by wildland fire would be instituted. Additionally, during the fires and suppression efforts, smoke, firefighter traffic, and the use of the lake to fill aerial attack aircraft would cause temporary, but frequent inconvenience and possible road and lake closures to visitors and local residents. Hazards left over after the suppression efforts, such as hazard trees, erosion of hillsides, may also impact visitor use.

These impacts to visitor use would occur during the hottest driest part of the fire season, which correlates to the period of highest visitor use.

Long-term impacts on visitor use could be experienced. Closures to visitor entry into areas experiencing burned area rehabilitation projects, closures of damaged park infrastructures, until repairs are completed, and other types of visitor use restrictions may occur.

(Visitor use) Alternative B – Preferred Alternative) – Suppression of all wildland fire, use of Mechanical Treatment, and use of prescribed fire to achieve resource objectives.

Under this alternative, impacts to visitor use would be substantially lower. Prescribed fires would generally be undertaken during the pre- and post-visitor use seasons when fire danger is lower and fewer visitors are present. There will be more specific instances of short-term visitor use restrictions, due to the inclusion of restrictions placed on public entry into prescribed fire project areas during the burn and mop-up stages. These restrictions would be of short duration, generally two – four days and the restrictions would be for a specific site not a general area as would occur under Alternative A. The timing of visitor use restrictions due to mechanical fuels reduction projects and prescribed fire projects can be determined by project managers, this is not the case for wildland fire suppression actions.

Long-term impacts on visitor use could diminish as hazard fuels are removed from sites and wildland fires move from potential high

intensity long duration events to lower intensity shorter duration events.

Safety

(Safety) Alternative A – Alternative A – (No Action) – Continue Full Suppression of ALL Wildland Fires, use of Mechanical Treatment, and no use of Prescribed Fires.

Safety of the public and Lake Roosevelt National Recreation Area personnel is the number one priority of the Lake Roosevelt National Recreation Area fire management program. Federal Wildland Fire Management Policy as implemented through NPS D.O.-18 reinforces that concept. This alternative relies on full suppression actions to insure the safety of the public and park personnel, with the strategies to achieve full suppression insuring the safety of wildland fire fighters.

Short-term impacts on safety concerning Alternative A are similar to historical impacts. The impacts are directly related to the severity of the fire and its location. The more severe the fire, the more difficult it will be for fire suppression resources to stop its spread. The larger a fire grows the more potential it exhibits to impact the safety of the public, Lake Roosevelt National Recreation Area personnel and firefighters.

Long-term impacts exhibited under Alternative A are for the continued build-up of unnatural fuel loading. The higher the fuel loading, the more potential for severe fire behavior. The more fires that exhibit severe fire behavior over time the more potential exists for impacts on the safety of the public, park personnel and firefighters. Therefore it is reasonable to expect an increase in impacts to public safety from wildland fires that occur under Alternative A over time.

(Safety) Alternative B – Preferred Alternative) – Suppression of all wildland fire, use of Mechanical Treatment, and use of prescribed fire to achieve resource objectives.

There will be an increase in fire events under Alternative B, due to the inclusion of prescribed fire projects. In the short-term, wildland fires will exhibit current fire behaviors, with associated safety concerns. Safety concerns for a prescribed fire, in prescription, should be minimal. This is due to the controlled nature of a prescribed burn, as confirmed through the use of a Lake Roosevelt National Recreation Area Superintendent approved prescribed fire plan.

In the long-term there will be a decrease in the severity of wildland fires as more of the park's hazard fuels are treated with prescribed fire and mechanical fuel reduction projects. A decrease in fire severity reduces fire containment times, thereby reducing the total area impacted by that wildland fire event. A reduction in the severity of a fire and the associated effort needed to stop its spread will reduce the amount of time that the public, park personnel and firefighters are exposed to the wildland fire situation, thereby reducing safety impacts.

APPENDIX A: LIST OF PREPARERS AND CONSULTANTS

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